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Notes on the Internal Improvements of the Continent of Europe. *By* L. KLEIN, *Civil Engineer.*

[CONTINUED FROM PAGE 149.]

5. *Vienna and Raab Railroad.*

If the northern railroad is distinguished by its great extent, another railroad, beginning also at Vienna, and taking a southern direction, is remarkable for the grandeur of style in which it is executed. This is the Vienna and Raab railroad now opened and in operation to Neustadt, thirty miles, and in progress to Glocknitz, seventeen miles. As its name denotes, one direction to be taken by this railroad is to Raab in Hungary, and it is proposed to touch Presburg also, and to be continued from Raab to Buda, the capital of Hungary. Another project is the continuation of the line from Glocknitz, the present southern terminus, through Styria and Illiria to Trieste, the important Austrian sea port. Even if only one of these extensions should be carried into execution, this railroad must be regarded as one of the most gigantic undertakings on the continent.

The company of the Vienna and Raab railroad was formed in 1838; in April, 1839, the works were commenced on the section between Vienna and Neustadt; part of the latter was opened on the 16th of May, and the whole on the 20th of June, 1841. The line passes through a beautiful country, highly cultivated, and covered with small towns and villages, along the foot of the picturesque mountains, which

amphitheatrically surround the metropolis. The principal place on the line besides Neustadt, is the watering place of Baden, a favourite resort of the Viennese during the summer. Another interesting place on the line is Moedling, situated on the entrance of the beautiful valley called the "Bruhl," whose wild and romantic scenery attracts thousands from the city every Sunday.

With such attractions for the public, the company calculated on a million of passengers per year, and the results of their operations have thus far proved the correctness of this calculation. They resolved, in the anticipation of a considerable revenue, to construct their road on the most approved plans, to make the buildings and other structures on the line such, that they may serve to embellish the environs of the city, and to provide the road with the best engines and cars.

The Directors and Engineer seem, however, to have transgressed the limits which a prudent economy and due regard to the interest of the Stockholders should have prescribed them; but before I point out some of the errors, which have been committed, I shall try to give a short description of the road.

The principal depot, or station, is outside of the barriers of the city and its suburbs, and distant nearly two miles from the centre of the former; passing a considerable distance along the southern suburbs, it crosses the turnpikes which lead to Laxenburg, Italy, Hungary, &c., on viaducts, avoids the Vienna hill, and approaches the mountains, on the foot of which it continues in a southern direction to Baden and Neustadt. From Neustadt to Glocknitz the line goes nearly straight to the south-west. The maximum grade between Baden and Neustadt is 18.4 feet; between Vienna and Baden thirteen feet, and between Neustadt and Glocknitz 40.6 feet per mile. The smallest radius of curvature on the whole line is 6,222 feet (6,000 Vienna feet.)

Between Vienna and Neustadt the railroad has been graded for a double track; the width of the road bed is twenty-nine feet; the excavations were made fifty-six feet wide on the bottom, to leave ample room for ditches, which are three and a half feet deep. The slopes are one and a half to one, and on some places two to one. Several high embankments and deep cuts were required to give the proper level on the located line. The highest embankment is 46½ feet, there are others of 41½ feet, 40½ feet, and thirty-two feet in height; the deepest cut is thirty-seven feet, partly in rock; 380,000 cubic yards of materials have been removed from this cut alone. The contents of excavations and embankments between Vienna and Neustadt is 4,500,000 cubic yards, and the average cost was seven cents per yard.

Of 136 road crossings, seventy-five are at the level of the railway, for the other sixty-one, bridges were constructed partly under and

partly over the railroad; amongst the latter is a lattice bridge of 125 feet span, the first one, I believe, executed in Germany. One hundred and twelve bridges and culverts were erected over streams and brooks, besides ninety small culverts of stone or wood for road crossings, &c. Many of the bridges are of large spans, or have oblique arches; at Baden there is a viaduct with forty-seven arches and 1431 feet in length.

A tunnel of 541 feet in length, twenty-nine feet wide, and twenty-five feet high, entirely arched with cut stones, belongs also to the interesting structures on the line. This tunnel has been built at an expense of 50,000 dollars, and is the first constructed in Austria. Having mentioned the principal works executed to bring the road bed to the proper level, I shall now briefly describe the superstructure:

Over the whole width of the road bed, in excavations as well as upon embankments, a layer of gravel, two feet thick, has been spread; cross-ties, twelve inches broad and four inches thick, were laid four feet apart, and longitudinal sills, nine inches broad and four inches high, fastened upon them with screw bolts; these sills serve as continuous supports to the iron H or ⊥ rail, weighing 52 lbs. per yard, which is kept fast by screws, the heads of which overlap the base of the rail. To effect a better contact, hair felt has been put between the base of the rails and the longitudinal sills. The ends of the rails, which are square, rest in flat chairs, weighing 12 lbs; the cross-ties and sills are of oak timber, and have cost thirty-five cents per cubic foot; the rails have cost 117 dollars per ton (2240 lbs.) delivered on the road, and the expense for the whole superstructure was 13,500 dollars per mile of single track. The railroad has a double track, and on account of the many stopping places, the sidings have besides a length of eight and a half miles. The width of track is four feet eight and a half inches.

The buildings erected on the Vienna and Raab railroad are both numerous and elegant. At the terminus at Vienna, the road is elevated seventeen feet above the natural surface of the ground, in order to let the turnpike roads pass under it; the passenger hall, where the passengers start and arrive, is therefore, in the second story of a large building, 385 feet long and ninety feet wide, covered with a free roof of this span. Below are the ticket offices, baggage room, &c., and two flights of stairs, one for the passengers who start, the other for those who arrive, lead to the waiting rooms and the cars. Near this building is the establishment for constructing and repairing locomotives and cars, surpassing in regard to its extent and machinery all others of this kind on any railroad. The whole establishment consisting of a large machine shop, a foundry, boiler shop, car houses, &c., occupies an area of 5000 square yards, and has cost 250,000 dollars.

Two high pressure engines, of twelve horse power each, serve to move the lathes, pump water, &c.; they were like the rest of the machinery imported from England. Last spring the following individuals were employed in this establishment: fifty-eight blacksmiths, eighty finishers, fifteen turners, twenty boiler makers, fourteen founders, sixty one joiners, ninety-nine carriage makers, twenty-six varnishers, thirty-five saddlers, and fifty-seven common laborers, in all 465 men. At the Vienna depot there is also a large building with three stories, serving at the same time as an hotel, and as a dwelling-house for the company's officers, a large watering station for the engines, &c.

Large depots are also at Neustadt, Baden and Moedling, and smaller ones on the numerous intermediate stopping places. At Baden the passenger halls are, like those at Vienna, upon an embankment in the middle of the long viaduct, above mentioned. There are also along the line twenty-eight houses for the men, constantly employed for watching and repairing the railroad, each of which contains a spacious lodging for a laborer with his family, and for some other men, when their assistance on the road should be required. There are in all on the railroad from Vienna to Neustadt, fourteen buildings with two or more stories, fifty-seven do. of one story, and forty-six viaduct stores.

The outfit consists at present in eighty-eight wheeled passenger cars of three different classes, built on the American model; some four-wheeled baggage cars and twenty locomotive engines. Of the latter, eleven are from England, three from Mr. Norris, in Philadelphia, and six were built in the company's own establishment, on the American principle.

The total cost of the railway from Vienna to Neustadt, including the machine shop, amounted to near 3,000,000 dollars, which is at the rate of 100,000 dollars per mile of road with a double track, with buildings, outfit, &c. The capital stock of the company is 6,250,000 dollars. The chief Engineer of the Vienna and Raab railroad is Mr. M. Shoenerer, under whose direction the Lintz and Gmunden, and the southern part of the Lintz and Budweis railroad have been constructed.

Whoever examines the above described railroad more carefully must become convinced, that far too much capital has been expended for objects not at all essential to the success of the undertaking; he finds, that by adopting more frequent changes in the grades, several heavy cuts and embankments could have been avoided; that there was no necessity at all for building a tunnel through a hill, which might have been entirely avoided by locating the line only a hundred yards farther east; that the superstructure is too strong and rigid, destruc-

tive to the cars and engines, and difficult to be kept in repair, on account of the timbers and rails being fastened together by screws; the strength of the rail is sufficient to do away with longitudinal bearing timbers, and a less costly superstructure would also have been the better one. The buildings are all very fine, one may say splendid, but the depots are not at all conveniently arranged for the accommodation of a great number of passengers. Had the buildings been made simpler, the depots, halls, &c., longer and wider, the money would certainly have been more judiciously applied. The eight wheeled cars are a good imitation of the American ones, as regards their appearance, size, arrangement of seats, &c.; but the trucks are badly constructed, the springs are too short, which, aided in part by the hardness of the road, makes the motion very uneasy. The introduction of engines of different manufactures is also no small mistake, which this company makes in common with so many others on the continent.

On the 16th of May, the line from Baden to Neustadt, about fifteen miles in length, was opened, and from that day up to the 28th of May, 1841, there traveled over the road, Passengers, 5,418 Income $1,202

A further section of road from Baden towards Vienna was put into operation on the 29th of May, and to the 19th day of June inclusive, were,	30,667	5,090
On the 20th of June, 1841, the whole line from Vienna to Neustadt was opened, and up to the 31st of July, 1841, there traveled	245,802	59,880
Total,	281,887	$ 66,172

It appears, therefore, that since the opening of the whole line, the average number of passengers per day has been 5,825, but on Sundays from 12,000 to 15,000 people generally traveled over the road. It may be estimated, that 180,000 passengers per month will use the road in summer, which for six months, would give already over one million. But we see at the same time, that the average receipt per passenger amounted only to 23½ cents,* and a million of passengers will therefore yield an income of only 235,000 dollars, which compared with the cost of construction, is short of eight per cent. Deduct one half as the expenses of operation, and there will remain only four per cent. as interest on the capital invested.

Such are the prospects of this railroad, which, if constructed with more economy, would have become the most productive in the mon-

* The passenger fare is one and three-fifths cent in the third class, two and one-third cents in the second, and three cents in the first class cars. The tickets for the different classes have different colours, corresponding to the colours of the cars.

archy. It is now dependent on a million of passengers per year, to yield a dividend of four, perhaps four and a half per cent. The stock is now sold at twenty-five per cent. below par, though the travel on the road exceeds all expectation.

Leaving out of sight the loss sustained by the Stockholders themselves, it must be regretted that the extravagant expenditure in the construction of this railroad, by its influence upon the comparative productiveness, will have a bad effect upon other undertakings of this kind, the accomplishment of which must in a considerable degree depend on the success of existing railroads.

6. *The first Hungarian Railroad, from Presburg to Tyrnau.*

The kingdom of Hungary, the largest province of the Austrian Empire, will also have its railroad communications. Several large projects are on foot, to extend this kind of improvements far into the interior of that vast country: that the Vienna and Raab railroad, above described, is intended to connect Vienna with Buda and Pest, has already been mentioned, as also, that a branch of the Emperor Ferdinand's northern road is to lead to Presburg, the seat of the Hungarian Diet. Of a much larger undertaking of a railroad through Hungary I shall have occasion to speak hereafter; the railroad I am now going to describe, is of minor importance, and more of a local interest, interesting however, as the first one brought into operation in Hungary. It extends from Presburg on the Danube to Tyrnau, passing some other small towns, and its total length is twenty-nine miles, of which one half is in operation, the other half in progress of construction.

The Presburg and Tyrnau railroad was projected as early as 1836, but the works were not commenced until late in 1839; the first section of the line, from Presburg to St. Georgen, was opened in September, 1840, and another section of five miles, to Boesing, at the end of June last. For this distance of fourteen miles the direction of the line is north-east, along the foot of the Carpathian mountains; it then takes a more easterly course to Tyrnau, where the road terminates.

There are many curves in the line, their smallest radius is 1500 feet; the road is undulating, and the maximum grade is thirty-five feet per mile. Total ascent from Presburg, 167 feet; descent, 119 feet. Line and profile have been chosen, to conform as much as possible to the natural surface of the ground, and to avoid large expenditure for grading and bridging. The superstructure is made according to the same views, that is, with regard to cheapness. Plate rails of two by seven-twelfths inches are fastened upon stringpieces of six by seven inches, which are keyed into cross-ties, formed of half-trees, twelve inches in diameter. The latter rest upon a bed of stones, with which material

all the spaces between the timbers are filled out to within three inches below the surface of the rails; the stones are then covered with a thin layer of gravel or sand, the road being worked by horse power. The track has the common width of four feet eight and a half inches.

The following are some of the average prices, so far as the road has been completed:

For excavating ground and forming embankments, per cubic yard measured only in excavations,	.07	cents.
For stone masonry in bridge abutments, per cubic yard,	$ 1.12	"
" brick masonry, " " "	1.50	"
" " " in arches, "	1.72	"

The cross-ties of oak cost forty-two cents a piece; the sills sixteen cents per running yard; the iron bars sixty-five dollars per ton; the laying down of track, including the formation of horse path, &c., has cost thirty-six cents per running yard of single track.

The expenditure for the part of the road already completed, amounted to 200,000 dollars, and the total cost of the whole line will not exceed 400,000 dollars, which is at the rate of only 13,800 dollars per mile, including buildings, outfit, &c. It is expected that about 100,000 passengers and 40,000 tons of freight (principally wood from the Carpathian mountains) will be transported annually over this railroad; it will therefore undoubtedly become a very profitable undertaking. Nevertheless, it was found very difficult to raise the funds necessary for the completion of the road, when the original capital of 250,000 dollars had been expended; so little confidence was put in the success of the undertaking, that the Directors had to appeal to the generosity, patriotism, and national pride of the Hungarians, to induce them to subscribe for the additional stock to the amount of 150,000 dollars. This stock was finally taken at the time when the shares had nearly no value at all in the market.

The following has been the traffic on the first nine miles of the road, from the opening of the same to the end of May, 1841:

		Income.
No. of passengers from Sept. 28, 1840, to April 30, 1841,	18,344	$ 1,581
" " in May, 1841,	6,788	577
Quantity of freight transported, 32,256 cwt.		575
		$ 2,733

The passenger fare was very low, viz:

			Per Mile.
For 9 miles from Presburg to St. Georgen,	1st class,	12.8 cts,	1.42 cts.
" " "	2d class,	8.0	0.89 "
" " "	3rd class,	6.4	0.71 "

Horse power is exclusively used upon this road; two horses generally take two cars, containing each twenty-four seats, and the distance of nine miles is performed in from fifty to sixty minutes. The whole line from Presburg to Tyrnau is expected to be finished early next year.

7. *Milan and Montza Railroad.*

This was the first railroad undertaken and executed in the Austrian dominions of Italy. The charter for it was granted on the 15th of November, 1839, and the work was executed early in 1840, so that on the 17th of August the line was put into operation. The total length of this road is only eight miles. From the 18th of August to the 31st of December, 1840, the number of passengers conveyed was 158,218, and the income 25,943 dollars.

8. *The Lombardo-Venetian Ferdinand's Road,*

From Venice to Milan, now in progress, was chartered on the 4th of April, 1840, and will have a length of 180 miles. It extends from Venice through the cities of Padua, Vicenza, Verona, Brescia, and Bergam to Milan; the section from Venice to Mestre has been first let, and the greatest work of this, and perhaps of any railroad hitherto executed on the continent, is the bridge over the Lagunes at Venice, which will have 252 arches and a length of 11,870 feet. This bridge was let on the 30th of July, 1840, for 805,000 dollars, for which sum it has to be built so as to serve also for the proposed aqueduct. Should the latter not be required, the stipulated sum is only 750,000 dollars. The cost of the whole railroad is estimated at 9,650,000 dollars, which is equal to 53,611 dollars per mile.

Railroads Projected, but not yet Commenced.

Several important projects for railroads in different provinces of the Austrian Empire have been undertaken in the last two years, with more or less prospect of an early accomplishment. The rumors of war, created last year by the critical state of the Oriental affairs, the stagnation of business, and the distrust in the success of those railroads which have been finished, have much retarded the progress of internal improvements, by preventing capitalists from embarking their money in similar undertakings. As yet, the government has not given any direct aid to railroads by taking stock, lending its credit, or guaranteeing a minimum interest to the Stockholders, as has been done in other parts of Europe. Such an assistance would serve to give a new impulse to enterprise, and insure an early execution to many interesting projects. The following are the railroads projected:

1. *The Bohemian Coal Railroad,* from Pilsen to Budweis in Bohemia, the object of which is the cheap transportation of coal from the rich mines near Pilsen to Budweis, and over the Budweis and Lintz

railroad to the Danube and to Vienna. The total length of this road, for which the surveys and plans have been finished, is 108 miles. Maximum grade, sixty feet per mile; smallest radius of curvature, 1200 feet. Country very broken, and unfavorable for the construction of a railroad. Estimated cost, about 4,000,000 dollars.

2. *The Prague and Dresden Railroad* is intended to connect the capital of Bohemia with that of Saxony, and has been recently projected. It is to unite at Dresden with the Leipsic and Dresden, and at Prague with the Vienna and Prague railroad, which latter will probably be executed by the company of the Emperor Ferdinand's northern road. The country is very hilly and mountainous, and the road confined to the narrow valley of the Moldun and the Elbe. Probable length, 122 miles; the surveys are now making.

3. *The Vienna and Trieste Railroad* is a gigantic project; in its proposed direction from Neustadt (to where the Vienna and Raab railroad extends) through Styria and Illiria, over Gratz and Laibach, it would have a length of 375 miles. There are four principal summits between Vienna and Trieste, on two of which horse power will have to be used. The maximum grade for the remainder of the road is fifty-five feet per mile. Nothing has yet been done towards the execution of this work.

4. *The Central Railroad of Hungary* commences at Presburg and goes along the left bank of the Danube to Pest, from thence in an easterly direction to Debretzin. Total length of main line 330 miles. The surveys for this railroad are made, and a company has been formed with a capital of 4,000,000 dollars, on which five per cent. have been called in. The works have not yet been commenced.

5. *The Railroad from Bochnia to Lemberg* is designed as a continuation of the Emperor Ferdinand's northern road, which terminates at Bochnia to Lemberg, the capital of Galicia, from whence it is ultimately to be continued to Brody, on the frontier of Russia. Distance from Bochnia to Lemberg, 190 miles. The surveys for this road have been recently commenced.

The total length of railroads now in operation in the Austrian Empire is 350 miles, of which 172 miles are worked by horses, and 178 miles by Locomotive engines. There are at present besides 175 miles of railroads under construction, and the total length of all railroads completed and in progress in Austria, is 840 miles; while the aggregate lengths of those railroads, which have been projected, but not yet commenced, is 1,125 miles. The total amount of capital already expended in the Austrian Empire for railroads will be about fourteen millions of dollars.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

On the use of Piles for Railway Superstructures. By JOHN C. TRAUTWINE, *C. E.*

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—Since the appearance in the January number of your Journal of my paper on the cast iron rail,* which I contemplate adopting on the Hiwassee railroad, I have received a letter from an esteemed professional friend, for whose opinion I entertain the highest regard, cautioning me in the strongest terms against the use of piles for my superstructure. He assures me that experience, so far as it goes, is entirely against them; and that their adoption on my road, would inevitably be injurious to my professional character.

In support of his opinion, he adds that every Engineer with whom he has conversed on the subject, coincides with him; and I am myself aware that a very general prejudice exists among the profession, not only in the United States, but in England, against employing piles in a railway superstructure. It is therefore with some hesitation that I venture to advance a contrary doctrine against so formidable an array of the fraternity; but after a close and careful investigation of the subject in all its bearings, I feel constrained so to do; having arrived at the conviction, not only that the grounds of prejudice against piles are entirely insufficient to justify their rejection, but that on the contrary, they may, by proper management, be made to furnish a road far less liable to derangement, either *vertically* or *horizontally*, than any of the plans now in common use; and moreover, that they will, where so employed, effect a diminution in the annual expenditures of many of our railroads, of at least 25 per cent.

This conclusion I have arrived at, after carefully comparing the piled superstructure with all the plans in general use, many of which have to a greater or less extent been constructed under my own immediate superintendence, thus affording me a fair opportunity of testing their several defects and advantages, and of instituting a comparison of their respective merits and demerits.

* I will here take occasion to correct two or three errors and omissions which I see have occurred (from the manuscript) in the above mentioned paper. On page twenty-four, four lines from the bottom, instead of "and more than six times as great as would be required to break it," read "and that one six times as great would be required to break it." Also, on second line from bottom, instead of "fifteen tons" for the test load of the rail, read "ten tons." This same error recurs at page twenty-six, six lines from the bottom. There is also an omission of reference to fig. *c* in the engraving.

Fig. *c*, represents the centre of the rail, showing the projecting flanges for confining the centre of the rail from longitudinal motion, so as to compel all contraction and expansion, by changes of temperature, to take place from the centre towards each end.

I would earnestly invite such of my readers as are sceptical on the subject, to defer coming to a final decision, until they have resorted to the same process for satisfying their doubts. I suspect that any impartial person who will take this trouble, will acquiesce in the opinions which I advanced in the paper alluded to, viz. that piles will before long supersede all other foundations for railroad superstructures.

Nothing can on reflection be more evident, than that no branch of constructive engineering, of equal importance, is so radically defective, as that of placing the superstructure of a railroad, which essentially requires the adjunct of the most unyielding support, upon almost the very *surface* of the earth, which is, of all foundations the most treacherous.

Instead of presenting a perfectly firm and incompressible basis for the rails, this, in wet weather, actually becomes, to a depth of several inches, so far as regards consistency, and resistance, either *vertically* or *horizontally*, but little better than a bed of mortar, or a layer of quicksand.

Let the reader who needs confirmation of this assertion, watch the progress of a train of loaded cars, over almost any of our railroads, after a few days of rain; when he sees the undulations that take place as the supports are alternately subjected to, and relieved from, the pressure of the engine and cars as they pass, he will more readily coincide with my views, and his only source of surprise will probably be, that the annual expenses for the adjustment of the track, are not more serious than they are. A calculation, which may serve for a moment's amusement, will show that every heavy rain creates an expenditure on a railroad 100 miles in length, of from $1,000 to $3,000.

Were the ground never wet, a railroad superstructure of common construction would answer its purpose admirably; either vertical or horizontal derangement would be almost impossible, and the road would retain its adjustments for years. Every Engineer is, I presume, acquainted with the almost entire resistance to wear, presented by perfectly dry earth; and knows that the most durable turnpike would be made, by merely sheltering from the weather the space it was intended to occupy, without any necessity for a stone covering.

But such an exemption from the action of water is not to be attained in either turnpike or railroad practice; and we are obliged to employ the best methods we can devise for resisting the encroachments of this insidious and powerful enemy.

That this has hitherto been effected, to the extent desirable in practice, no Engineer will assert; on the contrary, the inefficacy of all the plans hitherto resorted to for the purpose, is a source of great and

very serious annual expenditure on every railroad that has been constructed; in some cases absorbing so heavy a proportion of the income, as completely to destroy the character of the road, as an object of pecuniary investment.

The expenses for labour and materials for retaining the adjustments of superstructure, amount, on such of our wooden railroads as are doing a tolerable business, *to an average of about one-half the entire annual expenses of the concern.* It is true, we frequently see this item set down in the reports of Directors and Engineers, at much less than the above proportion; but when this is done, it is generally with reference to *new* roads, on which time for derangements of the track has not yet been allowed. On roads that have come fairly into operation, and are accommodating a good traffic, the above average assumption is tolerably correct, and applies as well to the flat bar road with light engines and moderate velocities, as to the most durable edge-rail road with its heavy engines, moving at high speed. It is scarcely necessary to suggest to any professional reader, the difficulty of attempting to assume *average* proportions in cases like the foregoing. They serve well enough the purposes of the general reader. The Engineer will take them at their worth.

When we reflect that this most serious item of railroad expenditure, is produced by the action of rain and frost, how solicitous should we be to adopt the necessary precautions, to obviate the effects of these agents, so far as lies in our power.

We cannot prevent the occurrence of either rain or frost; but we can place our foundations at a depth to which the action of neither can reach; and, at the surface, where their effects are most powerful, we can oppose to them such materials, and so arranged, as to render their attacks comparatively harmless.

It is common to employ trenches, some fifteen to twenty-four inches in depth, and filled with broken stone, under the immediate supports of our superstructures, whether of wood and iron, or of stone and iron. These trenches perform at least one good office, viz: the drainage of surface water, which would otherwise expedite the decay of the timbers; and to a considerable extent, they diminish the effects of the frost. They are, however, too shallow to remedy the evil resulting from the softening of the earth by rain, which percolating through the broken stone, collects in the bottom of the trench, and reduces the soil to a consistency affording very little *vertical* resistance to the pressure of passing loads, as the undulations after heavy rains fully prove.

It is moreover equally obvious, that the softened earth or mud at the *surface*, is not at all calculated to withstand the horizontal pressure of the trains; especially as they sweep rapidly around the curves, or

lurch violently from side to side on deranged portions of the straight lines. It has, I suspect, come within the observation of most of my professional readers, that on tolerably sudden curves the mere elasticity of the rail, or sometimes of the wooden string timbers, tending to restore themselves to their original straightness, not unfrequently exerts sufficient lateral pressure to overcome the resistance of the earth, and force the superstructure outwards, until it becomes, instead of a continuous curve, a mere series of chords.

I am by no means confident that even trenches filled with *solid concrete*, as now proposed by some, and which appear to meet with pretty general approbation with the profession, will be found entirely to remedy these defects; unless the trenches are deeper than those now commonly used in superstructures. If this precaution be attended to, the percolation of water, and consequently the action of frost, will be to a great degree prevented. But other difficulties suggest themselves in connexion with the use of concrete in this manner, which to me appear insuperable. For instance, the ground under these continuous lines of concrete cannot be expected to be of uniform consistency; and we know that high embankments do not reach their period of final settlement for several years; consequently, the concrete will, in many cases, act the part of a long stone girder, supported only at its ends; and again, it frequently happens that isolated rocks present themselves in the graded surface, which will prevent the centre of a given length of concrete from settling equally with the adjoining parts. Either of these occurrences will inevitably produce fractures, such as frequently occurred in the continuous granite sills of yore. I remarked above, that these difficulties appeared to me insuperable; I should have said, except at an expense that few railroad companies could afford to encounter. I should have no confidence in concrete formed of *common* lime only, for this purpose; and if hydraulic cement be used, the cost of continuous trenches of sufficient size would be enormous.

When we look at the plan of stone-block and edge-rail superstructure, there is even less to commend itself on the score of stability than in the wooden railroads. This is the plan of the Liverpool and Manchester road, and of some roads in the United States, on which the expenses of repairs and adjustments of track are very heavy. This item, of course, must increase with the traffic of the road, but it is also dependent to an equal degree, upon the weight and velocity of the engines. The engines now in common use are certainly too heavy for the superstructures of many of the railroads on which they run, and under such circumstances their introduction is adverse to every principle of true economy.

I confess, that when I first began to consider what could be done by

means of piles, to remedy the defects attending the ordinary methods of superstructure, they seemed to present more formidable obstacles than almost any other plan; and the apparent magnitude of their objectionable features was no doubt augmented by the prejudice which I had entertained against them. But upon reflection, these prejudices vanished. The ordinary plans of superstructure are liable to derangement *both vertically and horizontally;* no one will deny that piles are at least free from the former objection. We have then, in the ordinary plans, *two* movements to guard against; in the piled superstructure we have but *one.*

Nearly all the examples of piled roads in the United States, are either those in which the piles are left extending several feet above ground, as a substitute for embankment, and thus affording a great leverage for the lateral action of trains to operate through, to produce horizontal displacement; or, in other instances, they are driven through a soft superstructure of marsh, quicksand, &c., that their feet may rest on a firm subsoil. This latter case evidently resolves itself to all practical intents and purposes into the former; for the yielding surface stratum affords nearly as free a leverage for producing lateral motion, as if the upper part of the pile were in the air.

Other roads again, have short piles driven their entire length into firm soil; but here they are generally but about three feet in length, and intended as an economical substitute for stone blocks, and are plainly liable to the same derangements as they from rain and frost.

Lastly, piles are sometimes used not as *supports*, but as *stays.* They were, I believe, first employed in this manner by Mr. Brunel, on the Great Western railroad in England; nor do I know that the example has been subsequently imitated on any other roads. Mr. Brunel has placed them in the centre of the track, and the cross-ties are bolted *to their sides.* They are intended only as stays against lateral motion.*

Although somewhat irrelevant to the subject, I will here remark, that this plan of construction appears to me to be essentially defective. Unless the rail-timbers be rendered *absolutely free* from vertical motion, (and this I contend cannot be effected by any plan now in use) a very injurious strain must come upon the cross-ties, which will even-

* Mr. Brunel had another object in view, which constitutes the chief peculiarity of his pile plan of superstructure for the Great Western railway. It was, by employing the retaining power of the piles, to enable him to force sand or gravel beneath the continuous bearings of timber until they cambered, or received *an upward pressure* of about a ton per foot lineal; and Mr. Brunel expected, that the force thus made to act *upwards* against the underside of the continuous bearings, would countervail the pressure *downwards*, produced by the passing trains. (See 3rd English Ed. (1838) Wood on Railroads, p. 718.) Com. Pub.

tually uphold, as it were, the entire superstructure by means of their bolts, for at their ends, they inevitably *must* yield; while at their centre, they quite as certainly *cannot* do so. This defect might readily be obviated by making the bolt hole elliptical, the longer axis being vertical. A vertical motion could thus be allowed, which would not at all interfere with the lateral resistance of the piles.

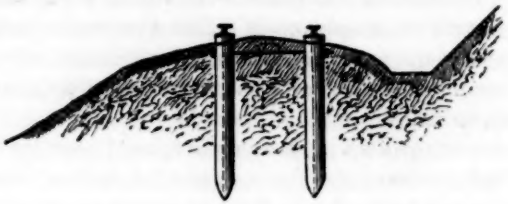
Here are, I believe, all the plans with which I am acquainted, in which piles have been employed in railroad superstructures; and it is, I suspect, entirely upon the self-evident inefficiency of any of these methods to combine vertical and horizontal stability, that the use of piles has been so universally denounced.

In the course of my own professional studies, I have invariably been more benefited by investigating instances of *failure*, than those of *success;* and it has been chiefly from the failures of piles in all the above cases, to fulfil their intended offices, that I have drawn my conclusions as to their entire efficiency, when so employed as to obviate the objections thus practically pointed out.

One very important collateral advantage resulting from the attainment of perfect stability in the superstructure, will be a diminution in the weight of the rail, which is one of the heaviest items of expense on railroads. The entire freedom from sudden shocks, and from the constant succession of *percussions*, which occur on all railroads of ordinary construction, will not only allow of such a diminution in the weight of rail, but will add greatly to the comfort of passengers, and prevent the injury which experience shows to result to many important articles of traffic, as flour, &c., from the jolting motion on a badly adjusted railroad. This stability will also remove the greatest impediment to the introduction of cast-iron rails; a matter in which not only railroad companies, but American iron masters, are deeply interested.

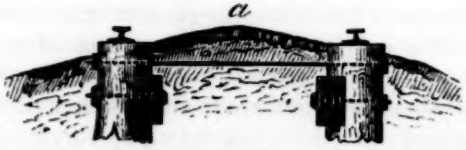
In employing piles as I propose, making them the principal source of immobility in railroad superstructures, two cases present themselves, requiring, or rather admitting of, some variation in the mode of operation. The first case, (which embraces the Hiwassee railroad) is that of a road in a warm climate, where the frost rarely penetrates to a greater depth than from three to six inches; and where the soil, being of a firm gravelly nature, enables us, by curving the road transversely, to confine the softening influence of even long continued rains, also, to a depth of a few inches. I am surprised at the want of attention to this method of drainage, every where observable on our railroads. It is one of the most simple, most perfect, and least expensive of any that can be adopted. Perhaps one half the water that now percolates through the broken stone to the bottom of the trenches could be thus got rid of.

In this case, I suspect, that piles from ten to fifteen inches in diameter, and averaging from six to ten feet in length, placed at intervals of from three to four feet apart from centre to centre, and driven down until their tops are but two or three inches above the surface, and connected transversely either by iron tie-rods, or by wooden cross-ties, would be found to answer every purpose. See figure.



Engineers are so apt to connect the idea of piles, with that of a soft, yielding foundation, that it is difficult to divest themselves of the association. The very term, pile, seems necessarily to involve lateral weakness; but in this case it is not so. Our piles are not supposed to be driven into a marshy soil, but into earth so compact as actually to require holes to be dug previously, through the upper consolidated stratum to a depth of two or three feet, to give them admission, for without this precaution, their driving would prove to be a troublesome business. But when firmly driven, and the soil well compacted around them by heavy rollers, the case more nearly resembles that of the stump of a tree, unyielding in any direction; and admits of no comparison with the instability of a common superstructure, with its base well lubricated with wet unctuous clay.

But let us, for the sake of argument, admit that some additional precautions *should* be found necessary in this instance; how easy would it be to apply it to any required extent, by simply bolting to the piles stout longitudinal pieces as shown in this sketch—*a*.



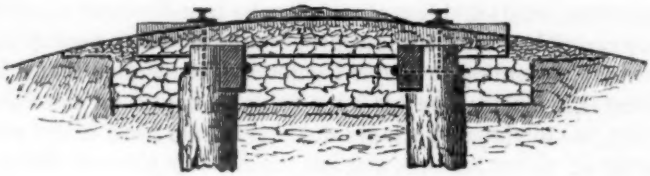
I do not know that it is a matter of much importance on which side of the piles the longitudinal pieces be bolted. We will now take leave of *case No.* 1, merely cautioning the reader once more, to divest himself of all notions of marsh-mud; and to substitute in his mind's eye, a firm, *dry* soil, almost incompressible by any force that can be applied to it. If necessary, a stratum of well rammed McAdam stone might be used to a depth of three or four inches, to facilitate the dis-

charge of rain water from between the rails. Should such a superstructure, in such a climate, and on such a soil, not be found infinitely more unyielding, both vertically and horizontally, than those on the ordinary plans, then will I of a truth exclaim, "peccavi," I have sinned.

Let us now pass on to *case No. 2*; by which I mean nothing more nor less than a railroad in a severe northern climate, where the rain and frost combined, produce a sensible deranging action on superstructures to the depth of about two feet.

Here, there is manifestly no more difficulty in securing the *feet* of the piles, or in other words, in attaining *vertical* stability, than in *case No 1;* the only essential point of difference is to provide for the heads of the piles, a stratum which shall at all times be (practically considered) perfectly dry, and incompressible; and on which the upward action of frost at the bottom of the stratum, shall be comparatively harmless.

b



This desideratum I propose to effect by the very plain process indicated by figure *b*, which represents a transverse section of a continuous trench, about eighteen inches deep and nine feet wide, filled with broken stone, to form the stratum alluded to. At the bottom of the trench, the stone might consist of tolerably large sized spalls; but a thin layer at top should be of McAdam size, to throw off rain as much as possible. After the piles are driven, and the longitudinal pieces bolted on by screw-bolts, the first layer of stone should be put in, and well rolled by a horse-roller; then the cross-ties put on, and the remainder of the stone introduced and finished off by ramming, to conform to the curved line, nearly covering the cross-ties.

My impression is, that the diminished action of the frost at this depth, will loose itself, as it were, among the broken stone; and that the stratum will at all times remain so compact as effectually to prevent lateral motion.

Of course, I do not wish to be understood as confining myself to the above forms of construction in the timber work; it may be modified according to the judgment of the Engineer. I think it probable that a mere covering of McAdam stone well compacted and properly attend-

ed to at intervals, would be found sufficient to keep the *natural* upper stratum dry, and if so, it would be attended by some saving of expense. Neither gravel nor sand would in my opinion answer as a substitute for broken stone for filling the trenches. The former would admit of compression from the roundness of its particles; and the latter, by becoming saturated with rain.

All I desire is to establish the supremacy of a piled superstructure over others hitherto employed. If my poor efforts in its behalf, accomplish nothing more than to induce the profession maturely to weigh its claims to a preference, I shall have accomplished my principal object in writing this paper; for I feel convinced that their so doing, will lead to its adoption. I particularly insist on the curved surface, and every other available means to effect *a thorough surface drainage.* This is all essential to *every* plan of railroad superstructure; and it is only surprising that so little attention has been paid to it. The ramming process should be repeated, whenever experience shall indicate a necessity for it; probably at every fall and spring, will be sufficient.

Should the heads and feet of the piles be found to bruise in driving, (as they certainly would without proper precautions to prevent it,) the former may, according to Major Turnbull, of the United States Topographical Engineers, (see his very valuable report on the Potomac aqueduct,) be obviated by simply dressing off the head of the pile to a concavity of about an inch, and adapting to it a piece of sheet iron; and the latter by nailing on a narrow strip of the same material.

On the score of expense, piles will be found to compare not very unfavorably with other plans of superstructure. To form a good and economical road, the timber should by all means be either Kyanized, or Earle-ized.* Probably, the latter process will be most extensively employed in future, as it is much the cheapest.

I have before asserted, that if the piled superstructure should succeed, (and I certainly see no reason to doubt that it will) it will effect a diminution of the annual expenses, and a consequent increase of annual profits, of at least twenty-five per cent. Before closing this paper, it may not be amiss to consider on what grounds my assertion is based.

In doing this, I will again admonish my professional reader of the

* Doubts have recently arisen with regard to the efficacy of Earle's process for the preservation of timber. These doubts are chiefly founded upon two facts:

I. The wooden pavement in this city, in Sixth street between Chesnut and George, a part of which was prepared by Earle's process prior to being laid, *now exhibits symptoms of decay.*

II. The recent admirable experiments of M. Boucherie, upon the means of preserving timber, show that whilst corrosive sublimate, and pyrolignite of iron, effectually protected vegetable pulps from decay; the sulphates of copper and iron, (employed by Dr. Earle) were so inert as to retard corruption in but a very trifling degree. Com. Pub.

difficulty one labours under in attempting to *average*, and *generalize* in these matters. If my assumptions should appear to some of them to be too low, and to others too high, let them exercise a little charity towards me; for I am fully sensible of the vagueness of deductions drawn from such premises.

Let us then assume the gross annual expenses of maintaining a single track railroad, doing a tolerable business, at $1,000 per mile per annum. One half of this, or $500 per mile per annum, may, in most instances, be assigned to labour, materials and tools, necessary for repairs and adjustments of the track; $300 of it to labour, and $200 to materials and tools.

Now on the supposition that our timber is Kyanized, we may safely count upon reducing the former item to $150, and the latter to $100, which gives an annual saving of expense of $250 per mile, which is twenty-five per cent on our assumed total expenses of $1,000. And if, moreover, we set down the annual expenses at one half the gross annual receipts, which on the average is not very far from the truth, we of course have, instead of an annual profit of $1,000 per mile, one of $1,250, or an increase of twenty-five per cent.

Certainly this is an object worth striving after, and one affecting seriously the success of the railroad system. Whether it can be secured by the adoption of a piled superstructure of Kyanized timber, must be left for experience to determine. I think it can, and I hold moreover to the belief, that the attainment of a *perfect (practical) railroad*, will be found essentially to depend upon the aid of piles.

Improvement of the Ohio River.

We are indebted to the politeness of C. B. Trego, Esq., of the House of Representatives of this state, for a copy of the report "Relative to the navigation of the Ohio River" made to the Senate, by a select committee, of which Mr. Darsie, of Alleghany, was Chairman.

From this document we extract two statistical tables, prepared by Mr. Josiah King, a merchant of Pittsburg, (at the request of the chairman of the select committee,) which are valuable, as furnishing a proximate view of the present export trade of that city, and the existing charges of transportation thence, by the Ohio river, in its present condition.

The report referred to, is designed to attract the attention of the Federal Government, to the importance of scouring away the shoals of the Ohio by *wing-dams*, so as to form a steamboat navigation, having at the lowest stages of the water a minimum depth of four feet from Pittsburg, in this state, to the falls in the river at Louisville, Kentucky, a distance of 609 miles. Com. Pub.

Table showing the amount of tonnage shipped at Pittsburg to ports on the Ohio river, from 15th July to 15th November, inclusive, in the years 1840–'41, at the various rates per 100 lbs. actually paid; the aggregate cost, the average cost per 100 lbs., the cost of the same at 25 cents per 100 lbs., and the excess aggregate sum paid over 25 cents per 100 lbs. Compiled chiefly from shippers' books, by J. King.

TABLE No. 1.

	Quantity of freight shipped at Pittsburg, at the following rates per 100 lbs., from the 15th of July to the 15th of November, 1840 and 1841.										Aggregate lbs. ship'd in 4 low water months 1840 & 1841.
	$1 75	$1 50	$1 25	$1 00	87½ cts.	75 cts.	62½ cts.	50 cts.	40 cts.	25 cts.	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Total lbs.
1840,	240,000	228,000	912,000	2,040,000	144,000	3,876,000	2,946,000	1,290,000	1,146,000	1,332,000	14,154,000
1841,	150,000	1,104,000	1,920,000	3,792,000	696,000	1,944,000	1,260,000	1,506,000	60,000	330,000	12,762,000
Total,	390,000	1,332,000	2,832,000	5,832,000	840,000	5,820,000	4,206,000	2,796,000	1,206,000	1,662,000	26,916,000

	Aggregate lbs. ship'd in 4 low water months, 1840 & 1841.	Aggregate cost of same.	Average cost per 100 lbs.	Aggregate cost computed at 25 cts. per 100 lbs.	Excess of actual cost over 25 cts. per 100 lbs.
	Total lbs.				
1840,	14,154,000	$102,626 30	72½ cts.	$35,385 00	$67,241 00
1841,	12,762,000	118,345 00	92½ "	31,905 00	86,340 00
Total,	26,916,000	$220,971 30		$67,290 00	$153,581 00

There were from 15th July to 15th November, 1841, departures of steamboats from Pittsburg, for ports on the Ohio river, 115.	
Estimated number cabin passengers, at $5 each above average high water rates, 5,750,	$28,750 00
Estimated number steerage passengers, at $2 each above average high water rates, 8,000,	16,000 00
There were, in same time, departures of Keels and Barges, 187, with 2,000 passengers, at $1 extra,	2,000 00
Add to this the extra amount on freights, as above, in 1841,	86,340 00
And we have an excess on the business of the port of Pittsburg alone, in one year, of	$133,090 00

You will observe that the above table contemplates only the business of Pittsburg. I have no data for estimating the business that pertains to the various other ports on the Ohio, but it is in all probability, altogether, four times as much as what is here exhibited. It should be borne in mind also, that if a permanent depth of three feet could be secured on the Ohio river, a vast amount of business would be done that is forced into other more lengthy and hazardous routes. It is now a matter of complaint by the Philadelphia merchants, that they were compelled, during the past summer, to pay 25 to $30,000 freight from Philadelphia to New York, on goods sold to their customers, who, from the low water in the Ohio, were forced to the longer and more expensive route of the Lakes.

Another important consideration in favor of improving the Ohio river is, that not only Pennsylvania, but Maryland, Ohio, and New York, have expended millions in constructing canals and railways with reference to the trade of this river, and almost every state in the Union has a deep interest in it as a link of much moment in their chain of commercial intercourse. There are about 400 steamboats on the western rivers, and at least 100 of those belong properly to the Ohio river trade; more than that number indeed were built and are owned at Pittsburg.

The following table is compiled from the records of the City Wharf Master.

TABLE No. 2.

1841.	Steamboat Arrivals,	Tonnage at Custom-House Measurement,	Keel Boat Departures,	Tonnage computed,	Depth of Channel, at 1st and 15th of month. 1st. Feet,	1st. Inches,	15th. Feet,	15th. Inches,	Flat—Depart,	Tonnage,
January,	23	3,440	12	260	Ice.		11.0			
February,	28	2,982	11	213	9.6		Ice.			
March,	93	12,235	27	623	4.6		6.0			
April,	94	12,908	48	1,013	15.0		9.4			
May,	86	12,463	49	1,090	12.3		10.0			
June,	66	7,514	50	1,100	4.6		2.5			
July,	34	3,732	49	1,485	4.4		1.11			
August,	8	319	57	2,115	1.9		0.11			
September,	13	1,028	60	2,460	1.3		1.0			
October,	47	3,521	44	1,510	2.10		2.6			
November,	69	8,539	43	1,100	2.10		4.0			
December,	59	8,047	24	530	5.2		11.0			
Total,	620	76,728	474	13,499					1,218	9,206
	653	79,850	Departures S. Boats.							
Total,	1,273	156,578	Arrivals and Departures.							

Note by J. King.—The steamboats arriving up the river from July to October may be said, generally, to carry no cargo. They take very little down, but run chiefly with reference to passengers, and for what freight they do take at stages of water below three feet high, rates say 75 to 150 per c. 100 wt. to Louisville, is charged. Boats of draft and bearings adapted to a thirty inch stage of water are multiplying; and if the river could be so improved as never to have less than thirty inches in channel, individual enterprise would immediately furnish boats in numbers adequate to carry any amount of freight that might offer, (it is confidently believed,) at 25 c. per 100 wt. and thereby if prices of freight be reduced to a proper standard on the Pennsylvania canals, render the Ohio river and Pennsylvania route, the *cheapest*, as it is the shortest and safest between most of the western states and the sea-board. The foregoing table is interesting, not as exhibiting a *large* business done, but as showing that a considerable business found its way via. Pittsburg, to the Ohio river, despite exorbitant rates both on the canals and river, amounting to $3 per 100 wt., from Philadelphia, or Baltimore, to Louisville; and thus demonstrating, that if the expense of the same service can be permanently reduced to $1 or $1¼, the route in question would be the favorite route, and all the while filled with goods and produce in transitu between the eastern and western cities. It is the opinion of experienced navigators of the Ohio river, that wooden steamboats can and will be constructed to carry eighty or 100 tons of cargo, on thirty inches of water, and that iron boats can be made to carry 100 to 150, on the same water.

Rules and regulations, proposed to be observed by Enginemen, Guards, Policemen, and others, on all Railways, recommended by the Railway Conference held at Birmingham, England, Jan. 1841.

Orders to Enginemen and Firemen.

I.—No locomotive steam engine, except in case of some extraordinary necessity, shall pass along the wrong line of road—that is to say, on the right hand line as it moves forward—but shall, in all cases, observe the same rule of the way as on the turnpike roads, by proceeding along the left-hand line. And every engineman and fireman shall keep a good look-out all the time the engine is in motion. And no person, except the proper engineman and fireman shall be allowed to ride on any locomotive steam engine or tender without the special license of the Directors, or of the engineer or manager of the railway.

II.—In case of accident, if any engine shall be unavoidably obliged to pass on the wrong line of road, the engineman shall always send his assistant, or some other person, back beyond the nearest stopping place, or shunt, before the engine moves backward, to warn any engine coming in the opposite direction; and if dark, the man who goes back in advance of a returning engine shall take a light, and make a signal, by waving the same UP and DOWN to any coming engine to stop; and the engineman of the engine moving on the wrong line shall make constant use of the steam-whistle, and must not move in the wrong direction further than to the nearest shunt, and being arrived there, shall proceed instantly to remove the engine off the wrong line of road.

III.—All engines traveling in the same direction shall keep half a mile at least apart from each other; that is to say, the engine which follows shall not approach within half a mile of the engine which goes before.

IV.—No engineman shall, at any time or under any circumstances, leave his engine or train, or any part of his train, on the line of way, without placing a man in charge of the same, to cause the proper signals to be made to prevent other engines from running against them.

V.—Enginemen having charge of goods or luggage trains shall always exert themselves to keep out of the way of coach trains, by shunting, if necessary; and, if doubtful of getting out of the way of a coach train, shall direct gatemen and plate-layers to make signal to coach trains that a luggage train is before them.

VI.—No engine, carriage, or wagon, or train of carriages or wagons, whether loaded or unloaded, shall (except only in case of absolute necessity, to prevent accident or collision) stop upon the line of any highway, so as to interrupt the passing along such highway or public road, whether the same be at, or near, to any of the stopping places on the railway or not.

VII.—No engine shall be allowed to propel before it a train of carriages or wagons, but shall in all cases draw the same after it, except when assisting up an inclined plane, or in case of any engine being disabled on the road, when the succeeding engine may propel the train

slowly as far as the next shunt, or turn-out, at which place the said propelling engine shall take the lead.

VIII.—In the event of the road being obscured by steam or smoke, (owing to a burst tube, or from any other cause,) any engine or train coming up shall not immediately pass through the steam or smoke, but the engineman shall stop at a sufficient distance to prevent a collision, and shall ascertain that the way is clear and safe before attempting to proceed.

IX.—If a coach train be stopping to take up or set down passengers, on the road, or for any other cause, luggage trains are not allowed to pass it, while so stopping, on the opposite line; and if the engineman of a *coach train* sees another coach train stopping on the road, he must slacken speed as he approaches it, and blow his whistle, to give notice to passengers belonging to the stopping train, that another train is about to pass them.

X.—In going down any inclined plane, every engineman having charge of a luggage train shall take care that he has full and complete control over the speed of his train, by pinning down, or causing to be pinned down, his wagon breaks, fewer or more, according to the size or weight of the train, whether there be a luggage breaksman with the train or not. And in case of accident for want of this proper control over the speed, the engineman shall be held responsible. And the policemen at the top of the inclines shall, and are hereby charged to, assist in pinning down the breaks, when desired so to do by the engineman of the train.

Rules to be observed during a Fog, or in Thick Weather.

XI.—Whenever a coach train stops at any of the stations or places for taking up or setting down passengers, (during a fog, or in thick weather,) the gateman or policeman of the station shall immediately run 400 yards behind the train, or so far as may be necessary to warn any coming engine, in order to prevent its running against the other: and all enginemen shall slacken speed in foggy weather, and proceed at a slow pace at an ample distance from, and as they approach, each of the stations and stopping places, in order that they may have the complete control of and be able to stop their engines and trains without risk of running against any train which may happen to be waiting at such station or stopping place. And in case any engine (whether with coaches or luggage wagons, or without) shall stop in foggy or thick weather in any part of the road where there shall be no platelayer to render assistance, the fireman shall immediately run back 400 yards, or so far as may be necessary to warn and stop any other engine coming in the same direction.

In foggy weather, enginemen are cautioned to make frequent use of their steam-whistle when they approach any station; also, whenever they are obliged to stop on the road, or when, from any cause, they are obliged to go slower than usual, in order to prevent accidents from trains which may be following on the same line.

Order to Gatemen and Policemen.

XII.—All policemen and gatemen are required, when a luggage train approaches their several stations, and before she comes up, to go on the line and inspect both sides of the train, to ascertain whether any of the loading (particularly bags of cotton or wool) have slipped so as to *overhang* the wagon more than when first loaded; and if such be the case, to make immediate signal for the *train to stop*, in order that the loading may be put right and fastened on again before the train proceeds.

N. B.—All enginemen, firemen, guards, policemen, gatemen and others to whom the foregoing rules may apply, are held responsible for their strict execution and observance; and they shall report to the Directors, or to their immediate superintendent, any servant of the Company who shall refuse or neglect to comply with the regulations hereby ordered to be observed.

Code of Signals recommended to be observed on all Railways.

By Night.—The *white* light, stationary, indicates that all is right, but if waved *up* and *down*, is a signal to stop; if waved *to* and *fro*, sideways, to proceed cautiously.

The *Red* light, stationary, is a signal *always to stop;* if on a moving train it is a caution to all following trains to keep the required distance.

By day.—The *Red* flag, or ball disc, is the signal always to stop.

The *Blue* flag, or ball, is to stop second class coach trains or luggage trains, for the purposes of traffic.

The *Black* flag is used by plate-layers, to indicate that the road is undergoing repair, and that trains must pass slowly.

It is to be understood, that any flag, or hat, or lamp, of whatever colour, waved up or down, is a signal to *stop.*

Regulations as to Signals.—1. Every train on the railway shall shew a red bull's eye, or reflector lamp, on the last carriage or wagon; and the guards of the coach trains, the breaksman of the luggage trains, and the engineman of an empty engine, or, with a wagon train without a breaksman, shall see to, and be held responsible for, the execution of this order; and if a coach, or truck, or horse-box, or wagon, be attached to, or detached from, a train on any part of the road, the guard, or breaksman, or engineman shall immediately change and replace the red bull's eye, or reflector lamp, so that the same may still be in the *rear* of the last carriage or wagon in the train, showing backward.

2.—Every engine tender must carry a lamp, so fixed as to admit of being turned round, exhibiting a *white* light forward, and a *red* light backward, in whichever direction the engine may be moving.

3.—Every gateman or policeman shall light his gate or station lamp at dusk, and shall have his hand lamp constantly trimmed and burning, and ready to give such signals as may be required.

4.—If a coming engine or train be required to stop to take up passengers, a *blue* light must be shewn in the gate-lamp; otherwise the common *white* light.

5.—If a train approaches when a previous train has passed through, only a few minutes before, the gateman shall signify this circumstance to the engineman by the waving of his hand-lamp *to* and *fro*, sideways, which means that caution is required; on which signal all enginemen are required to go slowly and keep a good look out.

6.—But if a gateman, owing to some accident, or any extraordinary cause, wish to stop an engine which is approaching, he must show his *red* light, and must also wave his hand-lamp *up* and *down*, up to the height of his head, and then down to the ground, till the engine comes up; and all enginemen are required to stop at either of these signals being given; and a gateman must make this signal to an approaching engine, if a previous engine has passed through his gate only one or two minutes before.

N. B.—The *red* flag, or ball, must be used in the day, in the same manner as the *red* lamp by night.

Rockets or *blue* lights are extraordinary signals, and when an engineman sees them he must immediately stop to ascertain their cause.

Engine Whistle.—7. When *one long whistle* is given, it is a signal to gate-keepers, policemen, and others in front, that an engine is coming, and this signal is to be used on approaching public roads, during a fog, or when a first class train approaches a station where a second class train is stopping, and generally as a caution when required, for persons on the line to keep out of the way.

But when an engineman wishes to make signal to the guards, or breaksmen, *on the train* that they are to put on their breaks and stop, he must give a *quick succession of whistles*, making an interrupted, tremulous, or vibrating sound; and all guards, or breaksmen, whether with coach or luggage trains, hearing this signal, *must immediately* hold hard on the break, or breaks, under their charge, so as to stop the train *as quickly as possible.*

Locomotive Engines on the English Railways.

It is doubtless known to most of our readers that on the railways of Great Britain, the Locomotive engines in use, may chiefly be separated into two distinct classes.

I. The *four-wheeled* engines, of the pattern manufactured by E. Bury, of Liverpool, and perhaps by others.

II. The *six-wheeled* engines, devised by R. Stephenson, and manufactured by various parties.

The first kind of engine has four wheels, coupled or uncoupled: when used to draw freight its wheels are coupled, but when employed as a passenger engine, the coupling bars (if it has them) are taken off, and but two wheels are then used as drivers.

These engines are commonly allowed only from one half to one inch play at both flanges, and have other peculiarities not necessary to be enumerated for our present purpose.

The second kind of engine has six wheels upon *a stiff frame*—the play allowed to the flanges is from one to two inches—the middle pair of wheels are usually, if not invariably, the drivers, and have no flanges: though we notice in the drawings of engines of this pattern, made by the Messrs. Rennie, and by the Messrs. Hawthorn, that flanges are shown to all the wheels.

There are, we believe, some locomotive engines of other forms used in England,—but they are comparatively few,—and for general purposes we may regard the English locomotives as admitting of the classification adopted.

We believe it has been a prevalent opinion in England that the six-wheeled engines—on account of their stiff frames, great length, and large flange play—were more apt to "fly the track" in consequence of lateral irregularities or curves in the road, than those with only four wheels; yet some serious accidents have occured with the latter, especially one on the London and Brighton railway, in October, 1841, where a four-wheeled engine, attached in front of one with six-wheels, was employed to aid it with a heavy train; and whilst the two machines were advancing with their load, at a pace of nearly thirty miles an hour, they entered an irregular piece of road, when the auxiliary, or four-wheeled engine, which was leading the van, suddenly commenced lurching, and upset from the track, causing the loss of several lives.

The coroner's jury who examined into the circumstances of this case, levied a small deodand upon the locomotives, and pronounced the opinion in their verdict, "that the four-wheeled engines used on this line, are not of a safe construction, and they recommend their discontinuance."

This verdict at once roused public attention to the subject, the condemnation of four-wheeled engines being directly in the face of the experience upon the London and Birmingham railway, where more than *ninety* similar machines of Bury's pattern were in use, and had conveyed some hundreds of thousands of passengers with great speed and perfect safety.

The press immediately engaged in the discussion of the relative merits of four and six-wheeled locomotive engines, and as might have been anticipated, diametrically opposite opinions were advanced—with equal plausibility and force on both sides—without reaching satisfactory conclusions.

Under these circumstances, Mr. Herapath, the editor of the Railway Magazine, undertook a special tour over the most important railways, by actually riding upon the locomotives with the engine drivers; proposing to note carefully the motions and peculiarities of the two species of engines, and collect a mass of practical facts, which would en-

able a sound and safe opinion to be formed upon this question, so important in English railway practice: the results of this tour have been communicated to the Railway Magazine, in a series of articles which we propose to republish for the information of our readers, though we must remark, that the working of the English machines does not have as direct an application to American locomotives as might be imagined, in consequence of the present almost universal use in this country of six-wheeled engines, *with leading and vibrating trucks*, which entirely and most favorably change the running character of the machine, from that inherent to the stiff framed six-wheeled engines employed upon the English railroads; the leading truck piloting the locomotive through curved and irregular portions of the way with a facility and success, which enables them to travel safely upon sinuous roads—even though curved with radii as low as 400 feet—with a speed, that if practicable at all, would certainly not be safe, with the six-wheels fixed upon a stiff frame, as in the English locomotive engines.

M.

From the Railway Magazine.

Facts and Observations on Four and Six-Wheel Engines. By John Herapath, Esq.

North Union.—The Company belonging to this line (from Parkside, on the Liverpool and Manchester railway to Preston, 22½ miles,) work with their engines the Preston and Wyre, nineteen miles, and Lancaster and Preston, twenty-one miles, and yet, strange to say, farm the carriage of their own goods upon their own line. They have twenty-three passenger engines, namely, two six-wheel engines and twenty-one four-wheel. Their six-wheel have outside bearings, and their four-wheel all inside. The six-wheel are about 12½ tons each, having four and a half tons on the front wheels, seven on the driving, and one ton on the hind wheels. Their mode of working these engines is somewhat peculiar. An engine runs one day 174 miles, the next 129, and the third day eighty-four, after which it rests for examination and reparation, if wanted, three days. They have no coupled engines, and their average gross load is about fifty tons, including engine and tender, and all their driving-wheels have flanges. The number of efficient engines is now twenty, which, compared with some other lines, speaks volumes in praise of the care and good management of their locomotive superintendent, Mr. Hunt, whom I found to be not only exceedingly polite and attentive, but a very observing and intelligent young man.

"We have only," says this gentleman, in the official reply to my circular, "had one broken cranked axle, broken in the cheek of the crank, and the engine was not able to proceed after the fracture. The engine—a six-wheel uncoupled engine—having outside bearings, was, I believe, the principal cause of the fracture, which happened in a curve descending sixteen feet a mile." No accident or inconvenience,

save delay, happened in consequence. Nor has any engine run off the rails.

Mr. Hunt speaks in very warm terms of Bury's engines, several of which are on the line.

The play of the wheels upon the rails of this line varies from three-fourths to seven-eighths of an inch. The cost of a four-wheel engine is £1,150; and of a six, £1,250. They find the four-wheel engines more economical in repairs, and burn a trifle less of coke. For instance, two six-wheel in the last year, including, it is said, some rather unusual repairs, cost £524; while seventeen four-wheel, for the same period, cost, altogether, £1,836; and the average consumption of coke per mile, by the four-wheel, is 35.42 lbs.; and of the six-wheel, 35.54 lbs. There is a trifling rolling motion in both four and six-wheel engines, when descending or upon curves, but Mr. Hunt thinks the six-wheel rather the steadier of the two. They have no engines which can be called top-heavy. In reply to the question whether they have any practical proof that the distance of the cranks from the longitudinal axis produces any sinuous motion, Mr. H. says, they have in an outside cylinder engine. He adds, from his experience on the Dublin and Kingstown railway, that the longer the connecting rod, and the wider the application of power is, the greater is the effect of sinuous motion. On the Dublin and Kingstown it seems there are outside bearings, and cylinders outside of these.

The total number of miles run per annum by all the engines of this company is 253,596, and the average of each engine, 13,347, the expense per mile of the locomotive power being 1s. 6.7d., including a sum for depreciation, which I could not ascertain exactly, but believe amounts to about the odd pence over the shilling.

Upon two of this company's engines I rode—namely, No. 13, a six-wheel engine, and No. 1, a four-wheel with outside cylinders, and four feet six inches wheels. The motion of the former engine I did not find to be at all different from that of other six-wheel engines; but the outside cylinder engine had some of that wriggling motion I observed in the American engines, but not so much as in Norris's. I must confess, however, notwithstanding I have found the same motions in all three engines I have ridden on having outside cylinders, that I am still unconvinced that it is exclusively due to the outside cylinders; but of this hereafter.

Manchester and Leeds Railway.—Before I say anything of the object of my visit to this line, I must be permitted to render my public acknowledgments for the generous and handsome conduct I have experienced from beginning to end from the Directors, officers, and all parties without exception, belonging to this company with whom I have come in contact. Captain Laws, the manager, has been particularly anxious to afford me every opportunity and facility for prosecuting my inquiries, and to him and Mr. Fenton, the superintendent of the locomotives, I am indebted for much valuable information.

I have indeed had the good fortune on this line to have made such observations, and to have such facts brought before me, as to enable

me to decide on one or two points, on which, before, I had great difficulty in making up my mind, and I therefore consider myself peculiarly fortunate in my intercourse with the Manchester and Leeds railway.

The length of the line worked by this company is sixty miles from Manchester to Leeds, but the portion constructed by them is only fifty-one miles, that is, from Manchester to Normantown, the junction with the North Midland railway. The company's stock of engines is thirty-eight, that is thirty-six six-wheel with outside bearings, and two four-wheel with inside bearings. Of these thirty-three are now in an efficient state. The six-wheel engines weigh in working trim about seventeen tons; the four-wheel thirteen tons, twelve cwt.; the weight on the front wheels of the six-wheel engines is six tons, on the driving eight and a half, and on the hind wheels two and a half. On the driving-wheels of the four-wheel engines the weight is about eight and a half tons.

Of the six-wheel engines eighteen have coupled wheels, and both the four-wheels are coupled.

Many of the driving wheels of the six-wheel—indeed, nearly all that I have seen—are without flanges, but others have them. The average gross load is 104 tons.

Owing to the heavy gradients on this line, particularly from Manchester to the summit, the engines are necessarily weighty. Of fourteen engines which began running July, 1839, only one crank axle, however, has broken; and of eighteen which began February, 1841, only two crank axles have broken; one from a flaw in the iron, and the other not. One was a coupled engine, and the other two uncoupled. They were unable to proceed with their trains, but no injury happened to any passenger in consequence. Notwithstanding, there are some sharp curves in this line, for instance, three respectively of fifteen, twenty, and thirty chains radius, and that the average speed is high, no engine has at any time run off the rails. The average pressure worked with is fifty-five lbs. to the square inch, the cost of the engines £1,500, the consumption of coke thirty-seven lbs. per mile, number of miles run per year by all the engines 594,000, expense of repairs 2s. 6d. per mile run.

The engines of this company generally run 120 miles each day, (changing, however, their times, so as to equalise the work of each) for five days successively, and then resting two days for examination and repairs. Each engine carries a sand-box to obviate the greasiness of the rails, which their heavy loads, and the almost everlasting dampness of the Manchester atmosphere render quite necessary.

The returns to me on this line are far more full than I have yet received from any other company. It appears that there are 147 men and boys, with wages varying from £2 6s. 8d. to boys 7s. 4d. per week, employed in the locomotive department only, making an average of £1 8s. 11d. per week; that the cost of coke for six months, ending August 31st last, was £3,786 7s. 6d., the wages on repairs done £977 1s. 10d., the cost of repairs not done by the company £1,643 1s. 5d.; the average speed in miles per hour actually performed by passen-

ger trains is twenty, the number of stoppages, exclusive of termini, being equal to 11½ miles per trip; the average weight of passenger trains, exclusive of engine and tender, fifty tons; and of goods trains, with the same exclusion, 104 tons; the average coke consumed per mile traveled, with passenger trains, is 35.52 lbs.; with goods, 48.02 lbs.; the average cost of repairs per mile traveled by the engines, is 2.62d.; cost of coke per mile, 3.09d.; cost of other charges, not included in repairs, 4.92d. per mile; and the total cost per mile of the passenger trains 10.12d. and of luggage 11.94d.; the weekly miles run for passenger trains are 7,140, for goods 2,732, and pilot engines 993. The length of the line is sixty miles, number of stations when the 147 men are employed is seven.

Mr. Fenton assured me that no engine comes in from the maker without undergoing most extensive alterations. The system of working expansively, and discharging the steam before the end of the stroke, it seems, has found its way long since into this establishment, together with other improvements in the chimney, fire-box, &c., which I shall hereafter notice, by which great savings accrue to the company in the working of the line. Captain Laws, indeed, in the general management, appears to be well seconded by the ability and untiring zeal of Mr. Fenton, in the locomotive department.

I have already alluded to the kind attentions I have received from the officers of this company—one, not among the least gratifying to me, was the putting on of a four-wheel engine, the "Clarence," with the coupling rod off, to take a train of goods as far as Rochdale, 10½ miles, and return with another load, that I might satisfy myself of any peculiarities of its action up and down steep gradients as a four-wheel engine. This was one of Bury's engines, and a play of 1.2 inch upon the rails. When in high speed she had a good deal of sinuous motion, but was free from pitching or rolling. At starting I observed her lift in front, so as to give me some alarm. This I found was occasioned by the road being sanded, which gave the wheels a good bite on the rails, the coupling link being some six inches above the axles of the wheels, and the steam being let on too rapidly.

While standing Friday morning, November 26th, on the platform with Mr. Gill, Captain Laws, and Mr. Fenton, an engine, the "Dewsbury," a six-wheel-engine, came in with a load which she had brought all the way from Todmorden, a distance of nineteen miles, wholly disabled in the left cylinder, and having drawn her load with the right only. A part of the road was up hill, but the greater portion down hill. When she came in I observed the left leading wheel much cut in the flange, and pointed it out to Captain Laws as an effect of the sharp curves on the line, which he, however, would not admit. Reflecting upon this, and after the engine had backed about 200 yards, a thought struck me that it might be owing to the action of one cylinder. I consequently hastened to her, and found that she had also her left trailing wheel flange a trifle cut (her driving wheels having no flanges,) but neither of the wheel flanges on the right side of her, it was evident, had approached the rails at all, or gone near them. With these facts I was much pleased, as affording practically conclusive evi-

dence on a disputed point, to which, in my report, I shall probably recur.

By some accident, I had not the good fortune to meet with Mr. Gooch, the company's engineer, who I understand is a very talented and well informed man.

The improvements which I have alluded to in the locomotives in this establishment are—

1st—An improvement in the chimney. As the makers deliver the engine it is cylindrical, fourteen inches diameter. The improvement consists in turning into the frustum of a cone, the upper part being thirteen inches diameter and the lower only ten. By this contrivance alone Mr. Fenton informed me that four cwt. of coke was saved on thirty-seven cwt. in a run of 120 miles, the blast pipe being opened from three to three and three-fourth inches in diameter.

2ndly—Various trials having convinced him that about sixteen inches was the best depth for the fuel of the fire when the bars were horizontal, but that in all cases of horizontal bars the coke near the door was in a less intense combustion than near the tube plate, he gave the bars an inclination of one in ten descending towards the tube plate, and placed the level of the bars near the door of the fire-box, 13½ inches below the lowest tube, which made the inner part of the bars 17½ inches below the said lowest tube, the fire-box being forty inches in length.

3rdly—For the purpose of taking away the damper from the chimney, he made the ash-box nearly air-tight all round except in front. By this means he stopped the further combustion of the coke, and lowered his steam at pleasure.

By the means of these improvements, and cutting off at five-sixths of the stroke and suffering the steam to escape, he successively improved the engines as they come from the maker. The following two are examples:—

Name.	As from Maker.	Improved July.	Further improved, Aug.	Do. do. Sep.
"Mersey,"	59.05lbs.	not running	32.27	27.27
"Irk,"	52.88	25.45	25.65	24.80

Upon the four-wheel engines of this company the weight on the driving wheels in a working trim is seven tons twelve cwt.; on the leading wheels six tons, cost £1,450; cost of the six-wheel engines, about £100 each more.

This company possess upon the whole an excellent stock of powerful engines, kept in a most efficient state of repair, and those on which I have rode are inferior in steadiness of motion to none that I have met with. I believe they reckon the engines of Sharp, Roberts, & Co. among their best.

Grand Junction.—I forgot in my account of the Grand Junction to mention that their gross average load is about fifty-eight tons; that some of their engines have only five feet driving wheels, though most are five feet six inches; that each engine runs about 195 miles the day of its work; that they have one four-wheel engine (which I understand is a pattern engine for the Paris and Rouen railway) built with

outside cylinders, and I believe five feet driving-wheels; and that the number of miles run daily by the engines, is 1588, including nineteen extra miles each journey between Manchester and Warrington.

I was exceedingly desirous of riding on the new four-wheel outside cylinder engine, for the purpose of seeing whether this engine had the same shuffling, wriggling motion that three others of the kind had on which I had rode. So anxious was I on this account that one very cold day I went without my breakfast to keep an appointment made with me to put the engine on, but was for some reason disappointed; the engine, which I believe was not at all on the list to go out, having been put on at a very different hour.

[TO BE CONTINUED.]

Practical and Theoretical Mechanics and Chemistry.

Analysis of Well-water, Philadelphia. *By* JAS. C. BOOTH and M. H. BOYE.

Induced to undertake the examination of this water by Mr. Samuel Webb, of Philadelphia, we deemed it a matter of sufficient interest to extend our investigations farther than required, in order to ascertain with precision all its constituents, and therefore, we think that it may not be uninteresting to some of the readers of the Journal.

The well is in the yard of 158 West Callowhill street, and was made by first digging about twenty feet through the common superficial clays, and then several feet into the Gneiss rock in a partially decomposed state. Although water was obtained in the clay, it was yielded much more abundantly after penetrating the rock, so that the water from the latter is the prevailing character of the fluid in question.

A sediment sometimes appears in it, but at the time we obtained it, it was said to be unusually clear. It was this clear water which we subjected to analysis. It exhibits a slight acid reaction, and deposites by standing at first a red flocculent precipitate of hydrated peroxide of iron, and subsequently coats the vessel containing it with an adherent layer of an ochrey color, consisting chiefly of the above oxide of iron with the carbonates of lime and magnesia. The same sediment was obtained more abundantly by evaporating the water into a small bulk and subsequent filtration. The sediment and the concentrated liquid evaporated to dryness, were separately investigated.

The deposite consists in 100 parts of:

Silica, - - - - - -	27.75
Peroxide of Iron, - - -	4.83
Carbonate of Lime, - - -	45.15
" Magnesia, - -	22.27
	100.00

The concentrated liquid, evaporated to dryness, gave a residue of the following composition:

Silica, - - - - - -	10.91
Peroxide of Iron, - -	a trace
Carbonate of Lime, - - -	4.09
" Magnesia, - -	3.40
" Soda, - - -	34.65
Chloride of Sodium, - - -	44.74
" Potassium, - -	2.21
	100.00

The whole amount of solid matter in one gallon of the water was 6.22 grains, of which about eight-fifteenths, or a little more than one half, was deposited during evaporation. In this should be included a small amount of sulphuric acid, and a mere trace of organic matter which were neglected in the analysis.

Observations on Mosaic Work and Cameo-cutting. *By* Ch. H. Wilson, Esq., *Architect, Edinburgh.*

The art of mosaic work has been known in Rome since the days of the republic. The severe rulers of that period forbade the introduction of foreign marbles, and the republican mosaics are all in black and white. Under the empire the art was greatly improved, and not merely by the introduction of marbles of various colours, but by the invention of artificial stones, termed by the Italians *smalti,* which can be made of every variety of tint.

This art was never entirely lost. On the introduction of pictures into Christian temples, they were first made of mosaic; remaining specimens of these are rude, but profoundly interesting in a historical point of view. When art was restored in Italy, mosaic also was improved, but it attained its greatest perfection in the last and present century. Roman mosaic, as now practised, may be described as being the production of pictures by connecting together numerous minute pieces of coloured marble or artificial stones; these are attached to a ground of copper by means of a strong cement of gum mastic, and other materials, and are afterwards ground and polished as a stone would be to a perfectly level surface; by this art not only are ornaments made on a small scale, but pictures of the largest size are copied. In former times the largest cupolas of churches, and not unfrequently the entire walls, were encrusted with mosaic. The most remarkable modern works are the copies which have been executed of some of the most important works of the great masters for the altars in St. Peter's. These are in every respect perfect imitations of the originals; and when the originals, in spite of every care, must change and perish, these mosaics will still convey to distant ages a perfect idea of the triumphs of art achieved in the fifteenth century. The government

manufactory in Rome occupies the apartments in the Vatican which were used as offices of the Inquisition. No copies are now made, but cases of *smalti* are shewn, containing, it is said, 18,000 different tints. Twenty years were employed in making one of the copies I have mentioned. The pieces of mosaic vary in size from an eighth to a sixteenth of an inch, and eleven men were employed for that time on each picture.

A great improvement was introduced into the art in 1775 by the Signor Raffaelli, who thought of preparing the *smalti* in what may be termed fine threads. The pastes or *smalti* are manufactured at Venice in the shape of crayons, or like sticks of sealing-wax, and are afterwards drawn out by the workman at a blow-pipe into the thickness he requires, often almost to a hair, and now seldom thicker than the finest grass stalk. For tables and large articles, of course, the pieces are thicker; but the beauty of the workmanship, the soft gradation of the tints, and the cost, depend upon the minuteness of the pieces, and the skill displayed by the artist. A ruin, a group of flowers or figures, will employ a good artist about two months when only two inches square, and a specimen of such a description costs from L.5 to L.20, according to the execution; a landscape, six inches by four, would require eighteen months, and would cost from forty to fifty pounds. This will strike you as no adequate remuneration for the time bestowed. The finest ornaments for a lady, consisting of necklace, ear-rings, and brooch, cost L.40. For a picture of Paestum, eight feet long, and twenty inches broad, on which four men were occupied for three years, L.1000 Sterling was asked.

The Mosaic Work of Florence,

I shall now notice before touching on cameo-cutting. It differs entirely from Roman mosaic, being composed of stones inserted in comparatively large masses; it is called work in *pietra dura.* The stones used are all, more or less, of a rare and precious nature. In old specimens the most beautiful works are those in which the designs are of an arabesque character. The most remarkable specimen of this description of pietra dura is an octagonal table in the *Gabinetto di Baroccio,* in the Florence Gallery. It is valued at £20,000 Sterling, and was commenced in 1623 by Jacopo Datelli, from designs by Ligozzi. Twenty-two artists worked upon it without interruption till it was terminated in the year 1649. Attempts at landscapes, and the imitation of natural objects, were usually failures in former times,—mere works of labour, which did not attain their object; but of late works have been produced in this art, in which are represented groups of flowers and fruit, vases, musical instruments, and other compatible objects, with a truth and beauty which excite the utmost admiration and surprise. These pictures in stone are, however, enormously expensive, and can only be seen in the palaces of the great. Two tables in the Palazzo Pitti are valued at £7000, and this price is by no means excessive. These are of modern design, on a ground of porphyry, and ten men were employed for four years on one of them, and a spot is pointed out, not more than three inches square, on which a man had

worked for ten months. But Florentine mosaic, like that of Rome, is not merely used for cabinet tables or other ornamental articles; the walls of the spacious chapel which is used as the burial-place of the reigning family at Florence are lined with pietra dura, realizing the gem-encrusted halls of the Arabian tales. Roman mosaic, as we have seen, is of great value as an ally to art; but Florentine mosaic can have no such pretensions, and time and money might be better bestowed.

An imitation of the pietra dura is now made to a great extent in Derbyshire, where the Duke of Devonshire's black marble, said to be quite equal to the famous Nero Antico, is inlaid with malachite, Derbyshire spars, and other stones; but the inlaying is only by veneers, and not done in the solid as at Florence. This, with the softness of the materials, makes the Derbyshire work much cheaper, and yet for a table, twenty to twenty-four inches in diameter, thirty guineas is asked. Were a little more taste in design and skill in execution shewn, the Derbyshire work might deserve to be more valued, as the materials, especially the black marble, are beautiful.

I shall now return to cameo-cutting. The art of cameo-cutting is of great antiquity, and is pursued with most success in Rome, where there are several very eminent artists now living. Cameos are of two descriptions, those cut in stone, or *pietra dura*, and those cut in shell. Of the first, the value depends on the stone, as well as in the excellence of the work. The stones most prized now are the oriental onyx and the sardonyx, the former black and white in parallel layers, the latter carnelian, brown and white; and when stones of four or five layers of distinct shades or colours can be procured, the value is proportionably raised, provided always that the layers be so thin as to be manageable in cutting the cameo so as to make the various parts harmonize. For example, in a head of Minerva, if well wrought out of a stone of four shades, the ground should be dark grey, the face light, the bust and helmet black, and the crest over the helmet brownish or grey. Next to such varieties of shades and layers, those stones are valuable in which two layers occur of black and white of regular breadth. Except on such oriental stones no good artist will now bestow his time; but, till the beginning of this century, less attention was bestowed on materials, so that beautiful middle-age and modern cameos may be found on German agates, whose colours are generally only two shades of grey, or a cream and a milk-white, and these not unfrequently cloudy. The best artist in Rome in *pietra dura* is the Signor Girometti, who has executed eight cameos of various sizes, from one and a half to three and a half inches in diameter, on picked stones of several layers, the subjects being from the antique. These form a set of specimens, for which he asks £3000 Sterling. A single cameo of good brooch size, and of two colours, costs £22. Portraits in stone by those excellent artists Diez and Saulini may be had for £10. These cameos are all wrought by a lathe with pointed instruments of steel, and by means of diamond dust.

Shell cameos are cut from large shells found on the African and Brazilian coasts, and generally shew only two layers, the ground being either a pale coffee-colour or a deep reddish-orange; the latter is most

prized. The subject is cut with little steel chisels out of the white portion of the shell. A fine shell is worth a guinea in Rome. Copies from the antique, original designs, and portraits, are executed in the most exquisite style of finish, and perfect in contour and taste, and it may be said that the Roman artists have attained perfection in this beautiful art. Good shell cameos may be had at from £1 to £5 for heads, £3 to £4 for the finest large brooches, a comb costs £10, and a complete set of necklace, ear-rings, and brooch, cost £21. A portrait can be executed for £4 or £5, according to workmanship.

Ed. New Philos. Jour.

On the Application of Water to Anthracite.

All persons who have been much accustomed to the use of anthracite for fuel seem to entertain an idea that the application of water has a beneficial effect. It is the invariable custom of the old inhabitants of the districts where no other fuel is used, to wet the coal before putting it on the fire. A wet paste of small culm, mixed with clay, makes a more lively and pleasant fire than small coal alone. This must arise from the clay retaining a portion of the water until decomposed by the ignited carbon of the coal producing the gases, carbonic oxide and carburetted hydrogen. It has been suggested that the application of vapour of water to anthracite fires in steam-boilers would supply the gaseous or volatile properties of bituminous coal; there is, however, much difficulty in the perfect development of the principle, arising from the compact structure of the coal, and the close manner in which the pieces of coal seem to adjust themselves in the fire. It is necessary that the coal be kept in an active state of combustion while the vapour is passing through, but so little passage being allowed through the fire, when the vapour of water is applied, it shuts off the supply of air, consequently the combustion is diminished. It requires both a very high temperature and a large quantity of pure air, with a full *quantum* of oxygen, to consume carburetted hydrogen—the most important of the two gases. Carbonic oxide burns at a very low temperature, and produces little heat. A quantity of flame may easily be produced by steam passing through an anthracite fire, but it is chiefly that of the latter gas, the former being volatilized without burning, and its powerful effect, consequently, lost. Besides the air necessary to keep up the combustion of the coal in the fire a large quantity is necessary to consume the gases, and that, too, at a high temperature. It appears impossible to attain these results with a common draught.

The writer, after considerable experience, is decidedly of opinion that anthracite cannot be used with advantage in ordinary boilers without a blast. When a blast is used, although it may be difficult, yet it is not impossible to devise a method of producing the full effect from the application of water to an anthracite fire; it is a subject of vast importance, and well worthy the attention of young mechanics and engineers—a fine field for the exercise of their ingenuity. It is quite certain that some anthracite contains ninety-five per cent. of pure carbon, and were it possible to render the entire effect of this

available, certain portions of it converted into volatile inflammable matter by its union with the elements of water, and steadily and continuously applied to the tube or flues of a boiler without loss, anthracite might be considered as a species of concentrated fuel—an invention of incalculable value for steamers going upon long voyages. When anthracite is used for blacksmith work, there is abundance of heat, but a large quantity of cinder is formed; this cinder has generally been considered as a mere oxide of iron, but it certainly contains carbon. It is the same cinder which is produced in large quantities in the refining process of iron works. Possibly oxygen and carbon, in the proportions to form carbonic oxide, are combined with the iron. A minute quantity of water running into a blacksmith's fire, when using anthracite, would remedy this—the presence of hydrogen preventing, in a great measure, the formation of the cinder. It is an axiom in the north of England, that a good gas coal is a good smith's coal, and *vice versâ*. It will be quite impossible to manufacture malleable or bar-iron of good quality, using anthracite for fuel, without the application of the vapour of water. This is a subject of the deepest interest to parties embarking in iron-works, where anthracite must be used for fuel. A patent for producing gas, by passing steam through a retort charged with anthracite, has been taken out by E. O. Manby, Esq., C. E., of Swansea—a gentleman possessing a thorough local knowledge of the anthracite district of South Wales, and who has had the best opportunities of judging of the powers and capabilities of the coal. He produces gas of great illuminating power rapidly and abundantly, which requires no purification. It seems likely that the distinguishing feature in the difference of the several varieties of coal depends upon the presence of the elements of water, either entire or in varying proportions, that are combined with the carbon—anthracite being quite free from them. It is a fair speculation to imagine that the anthracite veins of coal at some period possessed bituminous properties, but that being more immediately acted upon by volcanic commotion, all volatile matter was expelled, while extraordinary pressure being applied left the coal a solid compressed mass of carbon, constituting the peculiar characteristic of anthracite. Mining Jour.

Physical Science.

Electrotype.

The Bavarian sculptor, Stigelmayer, has brought to great perfection the galvano-plastic process. In the space of two or three hours colossal statues in plaster are covered with a coat of copper, which takes with the greatest accuracy the most minute and delicate touches, giving the whole the appearance and solidity of the finest casts in bronze. M. Stigelmayer has also applied his process to the smallest objects, as flowers, plants, and even insects, bringing them out with such accuracy, that they seem to have been executed by the hands of the most skilful artists.—***Letter from Munich.***

Mech. Mag., Sept., 1841.

Meteorological Journal for **1841**, *kept at the Lancaster Conservatory of Arts & Sciences, Lancaster, Pa., by* WASHINGTON L. ATLEE, M. D., *Obs.*

1841.		Barometer.			Attached Thermometer.			External Thermometer.					Hygr'm'tr, 2 P.M			Sky.				Winds.				Clouds.				Rain.
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean	Dew point.	Diff' bet dew pt. & therm.	Wet bulb.		7 A.M D's	2 P.M D's	9 P.M D's		7 A.M D's	2 P.M D's	9 P.M D's		7 A.M D's	2 P.M D's	9 P.M D's	Rain gauge In's.
January.	Average	29.51	29.45	29.56				26.05	35.33	31.92	23.69	29.37	25.53	9.88	32.63	Ent. clr	3	1	10	N.	2	1	2		1	0	0	
																				N. W.	6	5	8		2	0	1	
	Maximum	30.14	30.15	30.10				46.50	55.00	50.00	36.00	45.50	55.00	47.21	55.00	Ent.cld	17	19	16	N. E.	8	8	7		0	0	0	
																				S.	0	3	1		0	0	0	
	Minimum	28.92	28.91	28.78				-7.00	7.50	-1.00	-7.00	3.75	-29.71	0.00	7.50	Prt. clr.	11	10	4	S. W.	6	5	5		2	1	2	
																				S. E.	2	1	3		0	0	0	
	Range	1.22	1.24	1.32				53.50	47.50	51.00	43.00	41.75	84.71	47.21	47.50					W.	4	5	4		3	8	1	
																				E.	3	2	0		0	0	0	
Omitted			1	1					1	1		1	1	1	1			1	1			1	1		20	21	17	6.430
February.	Average	29.32	29.29	29.32				25.04	36.39	27.16	22.43	29.38	22.51	13.86	32.14					N.	0	4	1		0	0	0	
																				N. W.	5	7	10		2	7	1	
	Maximum	29.73	29.67	29.64				40.00	54.00	41.00	36.00	42.75	37.36	28.97	45.00	Ent. clr	8	5	18	N. E.	7	4	3		0	0	0	
																				S.	1	0	2		0	0	0	
	Minimum	28.79	28.86	28.89				3.00	13.00	4.00	2.00	7.50	1.82	0.00	12.00	Ent.cld	9	7	6	S. W.	12	6	5		1	1	1	
																				S. E.	0	0	3		0	0	0	
	Range	.94	.81	.75				37.00	41.00	37.00	34.00	35.25	35.54	28.97	33.00	Prt. clr.	11	16	4	W.	3	6	4		8	7	2	
																				E.	0	1	0		0	0	0	
Omitted																									10	8	6	1.150
March.	Average	29.47	29.41	29.41				35.10	49.16	38.63	32.05	41.60	31.00	18.20	41.85					N.	4	3	5		2	0	0	
																				N. W.	2	4	4		4	2	2	
	Maximum	29.84	29.79	29.74				56.50	73.00	61.00	53.00	64.00	63.51	38.15	67.00	Ent. clr	7	7	11	N. E.	7	6	7		1	1	0	
																				S.	3	2	3		0	0	0	
	Minimum	28.75	28.83	28.59				18.50	28.00	25.00	18.50	26.50	1.15	0.00	25.50	Ent.cld	13	12	14	S. W.	5	5	1		0	3	0	
																				S. E.	2	1	4		1	0	0	
	Range	1.09	.96	1.15				38.00	45.00	36.00	24.50	37.50	64.66	38.15	41.50	Prt. clr.	11	12	6	W.	6	7	3		7	9	3	
																				E.	2	3	4		0	0	0	
Omitted																									9	9	15	4.057

Meteorological Journal – Continued.

1841.		Barometer.			Attached Thermometer.			External Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.				Clouds.				Rain.
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean	Dew Point.	Diff. bet. dew pt. & therm	Wet bulb.		7 A.M D's	2 P.M D's	9 P.M D's		7 A.M D's	2 P.M D's	9 P.M D's		7 A.M D's	2 P.M D's	9 P.M D's	Rain gauge. In's.
April.	Average	29.43	29.45	29.41	46.70	55.48	48 88	45.00	55.29	46.22	40.55	47.53	44.83	10.69	49.94					N.	1	1	3		0	2	0		
																				N.W.	7	7	8		6	7	2		
	Maximum	29.94	29.92	29.91				61.00	70.00	60.50	55.00	62.00	63.08	32.04	65.00	Ent. clr	5	2	8	N. E.	9	3	3		1	2	0		
																				S.	2	2	3		0	2	0		
	Minimum	28.53	28.57	28.63				31.50	37.00	32.00	29.00	33.75	23.09	0.00	37.00	Ent.cld	16	10	12	S. W.	4	5	3		4	1	0		
																				S. E.	4	4	8		0	2	0		
	Range	1.41	1.35	1.28				29.50	33.00	28.50	26.00	28.25	39.99	32.04	28.00	Prt. clr.	9	16	10	W.	1	3	1		6	5	3		
																				E.	2	3	1		0	1	0		
Omitted			2						2			2	3	3	3			2				2			9	6	17	3.956	
May.	Average	29.41	29.40	29.42	55.40	67.16	59.52	54.87	67.87	56.59	49.21	58.53	50.21	17.68	58.08					N.	4	2	2		1	0	1		
																				N.W.	7	14	9		10	15	4		
	Maximum	29.66	29.64	29.60				71.00	84.50	73.00	66.50	75.25	68.56	31.69	73.00	Ent. clr	8	2	8	N. E.	4	3	5		1	1	0		
																				S.	1	3	3		0	0	0		
	Minimum	28.94	28.96	28.89				34.00	47.00	37.00	30.00	40.00	33.23	0.00	43.00	Ent.cld	10	5	7	S. W.	8	5	5		3	8	1		
																				S. E.	5	3	6		0	2	1		
	Range	.72	.68	.71				37.00	37.50	36.00	36.50	35.25	35.33	31.69	30.00	Prt. clr.	13	24	16	W.	2	1	1		4	5	0		
																				E.	0	0	0		1	2	0		
Omitted																									4		17	2.360	
June.	Average	29.46	29.45	29.44	69 27	80.30	74.13	67.78	80.80	70.22	64.62	72.54	63.00	17.82	68.90					N.	5	2	1		0	3	0		
																				N.W.	3	3	7		2	3	2		
	Maximum	29.60	29.65	29.63				77.00	92.00	80.00	73.00	81.50	73.51	32.37	76.00	Ent. clr	12	8	10	N. E.	3	3	3		2	0	0		
																				S.	5	6	5		1	1	0		
	Minimum	29.27	29.25	29.21				57.00	63.00	58.00	54.00	62.50	50.76	0.00	62.00	Ent.cld	12	5	7	S. W.	5	5	9		4	5	3		
																				S. E.	6	2	6		1	2	0		
	Range	.33	.40	.42				20.00	29.00	22.00	19.00	19.00	22.75	32.37	14.00	Prt. clr.	6	17	13	W.	3	8	1		2	7	1		
																				E.	0	1	0		0	0	0		
Omitted																									6	3	15	3.755	

1841.		Barometer.			Attached Thermometer.			External Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.				Clouds.				Rain.
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean	Dew point.	Diff. bet. dew point and therm.	Wet bulb.		7 A.M.	2 P.M.	9 P.M.		7 A.M.	2 P.M.	9 P.M.		7 A.M.	2 P.M.	9 P.M.		Rain gauge
																	D's	D's	D's		D's	D's	D's		D's	D's	D's		In's.
July.	Average	29.54	29.53	29.52	69.29	82.55	72.18	68.74	82.26	70.37	65.61	73.94	59.59	21.44	68.19					N.	4	1	4		1	3	0		
																				N.W.	7	9	6		7	6	0		
	Maximum	29.85	29.81	29.82				80.00	92.50	80.00	78.00	83.75	74.17	27.47	78.00	Ent. clr	12	2	14	N. E.	4	3	2		1	2	0		
																				S.	3	5	2		0	1	0		
	Minimum	29.27	29.27	29.33				60.00	70.00	61.50	55.00	66.00	45.58	0.00	59.00	Ent.cld	4	2	4	S. W.	11	7	9		3	2	0		
																				S. E.	1	0	5		0	1	0		
	Range	.58	.54	.49				20.00	22.50	18.50	23.00	17.75	28.59	27.47	19.00	Prt. clr.	15	27	13	W.	1	5	3		8	14	2		
																				E.	0	1	0		0	0	0		
Omitted.																									2	1	15		1.430
August.	Average	29.61	29.61	29.60	68.50	79.68	72.87	66.10	79.97	69.27	64.08	71.88	62.96	17.00	68.65					N.	1	3	2		0	2	1		
																				N.W.	3	4	2		0	2	1		
	Maximum	29.85	29.84	29.85				75.00	89.00	77.50	72.50	79.25	72.93	26.53	75.00	Ent. clr	5	2	10	N. E.	4	5	5		2	3	0		
																				S.	4	8	5		0	3	0		
	Minimum	29.47	29.46	29.45				58.00	68.00	62.50	57.00	62.50	53.48	5.72	62.00	Ent.cld	8	4	7	S. W.	7	3	5		8	4	0		
																				S. E.	8	3	8		0	3	0		
	Range	.38	.38	.40				17.00	21.00	15.00	15.50	16.75	19.45	20.81	13.00	Prt. clr.	18	24	13	W.	0	2	2		9	8	3		
																				E.	4	2	2		2	5	1		
Omitted			1	1					1	1		1	1	1	1			1	1			1	0		6	4	15		3.835
252 September.	Average	29.52	29.51	29.52	64.23	74.29	67.35	61.48	74.84	63.78	59.93	67.38	62.48	12.36	66.72					N.	3	2	3		0	1	0		
																				N.W.	6	6	5		1	1	2		
	Maximum	29.80	29.79	29.80				71.50	88.00	77.50	71.50	78.25	73.50	21.85	74.00	Ent. clr	11	4	15	N. E.	4	3	7		0	2	0		
																				S.	2	6	3		0	4	0		
	Minimum	29.14	29.16	29.22				49.00	58.50	50.00	48.00	56.75	48.89	0.00	55.00	Ent.cld	11	8	7	S. W.	5	3	2		2	4	3		
																				S. E.	5	4	6		1	1	0		
	Range	.66	.63	.58				22.50	29.50	27.50	23.50	21.50	24.61	21.85	19.00	Prt. clr.	8	17	8	W.	1	3	1		7	7	0		
																				E.	4	2	3		0	4	0		
Omitted			1						1			1	1	1	1			1				1	0		8	3	10		2.200

Meteorological Journal—Continued.

1841.	Barometer.			Attached Thermometer.			External Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.				Clouds.				Rain.
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 P.M.	2 P.M.	9 P.M.	Reg'r.	Mean	Dew point.	Diff. bet. dew point and therm.	Wet bulb.		7 A.M D's	2 P.M D's	9 P.M D's		7 A.M D's	2 P.M. D's	9 P.M D's		7 A.M D's	2 P.M D's	9 P.M D's	Rain gauge In's.
October. Average	29.53	29.51	29.51	45.31	55·70	48.75	42.40	56.12	45.25	40.69	48.32	43.30	11.98	50.38					N.	6	4	7		0	4	0	
Maximum	29.88	29.90	29.90				58.00	66.00	58.00	56.50	60.25	64.00	24.63	64.00	Ent. clr	13	4	14	N. W.	7	12	8		5	9	0	
Minimum	28.93	28.96	28.97				30.00	41.50	30.50	27.00	35.75	25.76	0.00	36.00	Ent.cld	5	6	6	N. E.	3	2	2		1	1	0	
Range	.95	.94	.93				28.00	24.50	27.50	29.50	24.50	38.24	24.63	28.00	Prt. clr.	13	20	10	E.	2	4	3		0	0	0	
																			S.	9	6	7		3	2	0	
																			S. W.	0	0	0		0	0	0	
																			S. E.	3	1	3		6	8	2	
																			W.	1	1	0		0	0	0	
																			E.		1	1		3	3	15	1.855
Omitted		1	1					1	1		1	1	1	1			1	1									
November. Average	29.44	29.40	29.42	40.73	46.93	42.20	38.15	46.59	39.48	35.35	40.78	37.26	9.29	42.76					N.	5	3	2		1	3	0	
																			N. W.	5	10	7		7	5	1	
Maximum	29.96	29.90	29.91				59.50	72.00	62.00	55.50	63.75	67.52	27.55	69.00	Ent. clr	4	1	10	N. E.	5	4	6		0	0	0	
																			E.	2	4	3		0	1	0	
Minimum	28.97	28.90	29.01				17.00	30.00	21.00	16.00	25.75	16.62	0.00	27.00	Ent.cld	14	9	10	S. W.	8	6	5		3	3	1	
																			S. E.	1	0	2		0	0	0	
Range	.99	1.00	.90				42.50	42.00	41.00	39.50	38.00	50.90	27.55	42.00	Prt. clr.	12	19	10	W.	4	1	4		3	6	1	
																			E.	0	1	1		0	0	0	
Omitted		1						1			1	1	1	1			1				1			12	11	17	3.127
December. Average	29.44	29.41	29.42	33.42	39.42	36.82	29.73	39.10	33.74	28.12	33.65	31.20	7.96	36.47					N.	3	2	4		0	1	1	
																			N.W.	4	8	7		2	6	2	
Maximum	30.03	30.06	30.07				46.50	54.00	53.00	50.50	47.50	51.00	27.36	51.50	Ent. clr	10	4	7	N. E.	3	4	6		0	0	0	
																			E.	2	2	3		0	0	0	
Minimum	28.80	28.77	28.87				10 50	24.50	19.00	10.50	17.75	9.25	0.00	22.00	Ent.cld	13	12	13	S. W.	9	5	3		4	3	0	
																			S. E.	3	2	2		1	0	0	
Range	1.23	1.29	1.20				36.00	29.50	34.00	40.00	29.75	41·75	27.36	29.50	Prt. clr.	8	14	11	W.	4	6	6		4	6	0	
																			E.	3	1	0		0	1	0	
Omitted		1						1			1	1	1	1			1				1			10	10	21	3.295

| *Average of* 1841. | | | | | | | | | | | | | | | | | | |

Average of 1841. | *Total of* 1841.

		Barometer.			Attached Thermometer.			External Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.				Clouds.			Rain.
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean	Dew point.	Diff. bet. dew point and therm.	Wet bulb.		7 A.M	2 P.M	9 P.M		7 A.M	2 P.M	9 P.M		7 A.M	2 P.M	9 P.M	Rain gauge,
																	D's	D'	D's		D's	D's	D's		D's	D's	D's	In's
1841.	Average	29.475	29.452	29.462				46,70	57.81	49.39	43.86	51.24	44.49	14.01	51.31					N.	38	28	36	6	19	2		
																				N.W.	62	89	81	48	63	18		
	Maximum	30.14	30.15	30.10				80.00	92.50	80.00	78.00	83.75	74.17	47,21	78.00	Ent. clr	98	42	135	N. E.	61	48	55	9	12	0		
																				S.	27	45	34	1	12	0		
	Minimum	28.53	28.57	28.59				–7,00	7.50	–1.00	–7,00	3.75	–29,71	0.00	7.50	Ent.cld	132	99	109	S. W.	89	61	59	37	37	11		
																				S. E.	37	20	53	3	11	1		
	Range	1.61	1.58	1.51				87.00	85.00	81.00	85.00	80.00	103.88	47,21	70.50	Prt. clr.	135	216	118	W.	32	18	33	67	90	18		
																				E.	19	18	11	3	13	1		
Omitted			8						8	3		8	9	9	9			8	3			8	3	99	76	180	37.430

Average of Winter Months, 1840–41. | *Total of Winter Months*, 1840–41.

Winter, 1840–41.	Average	29.43	29.39	29.45				25,09	35.76	28.89	22.70	29,17	24.80	10.98	32.49					N.	5	6	4	2	1	0		
																				N.W.	18	20	27	7	12	4		
	Maximum	30.14	30.15	30.10				46.50	55.00	50.00	36.00	45.50	55.00	47.21	55.00	Ent. clr	22	13	45	N. E.	21	16	15	0	0	0		
																				S.	4	5	7	0	0	0		
	Minimum	28.79	28.78	28.78				–7.00	7.50	–1.00	–7.00	3,75	–29.71	0.00	7.50	Ent.cld	35	35	30	S. W.	22	17	13	4	2	3		
																				S. E.	3	1	7	0	0	0		
	Range	1.35	1.37	1.32				53.50	47.50	51.00	43.00	41.75	84.71	47.21	47.50	Prt. clr,	33	41	14	W.	14	21	16	21	23	6		
																				E.	3	3	0	0	0	0		
Omitted			1	1					1	1		1	1	1	1			1	1			1	1	36	39	32	11.880

Average of Spring Months, 1841. | *Total of Spring Months*, 1841.

Spring, 1841.	Average	29.44	29.42	29,41				44.99	57.44	47.15	40.60	49.22	42.01	15,52	49,96					N.	9	6	10	3	2	0		
																				N.W.	16	25	21	20	24	8		
	Maximum	29.94	29.92	29.91				71.00	84.50	73.00	66.50	75,25	68.56	38.15	73.00	Ent. clr	20	11	27	N. E.	20	12	15	3	4	0		
																				S.	6	7	9	0	2	0		
	Minimum	28.53	28.57	28.59				18.50	28.00	25.00	18.50	26.50	1.15	0.00	25.50	Ent.cld	39	27	33	S. W.	17	15	9	7	12	1		
																				S. E.	11	8	18	1	4	1		
	Range	1.41	1.35	1.32				52.50	56.50	48.00	48.00	48.75	67.41	38.15	47.50	Prt. clr.	33	52	32	W.	9	11	5	17	19	6		
																				E.	4	6	5	1	3	0		
Omitted			2						2			2	2	2	2			2				2	0	22	15	49	10.373

Meteorological Journal—Continued.

		Average of Summer Months, 1841.														*Total of Summer Months*, 1841.																	
		Barometer.			Attached Thermometer.			External Thermometer.					Hygr'm'tr, 2 P.M.			Sky.				Winds.				Clouds.				Rain.					
		7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	Reg'r.	Mean	Dew point.	Diff. bet. dew point and therm	Wet bulb.		7 A.M	2 P.M	9 P.M		7 A.M	2 P.M	9 P.M		7 A.M	2 P.M	9 P.M		Rain gauge.					
																	D's	D's	D'		D's	D's	D's		D's	D's	D's		In's.					
Summer, 1841.	Average	29.54	29.53	29.52	69.02	80.84	73.06	67.54	81.01	69.95	64.77	72.79	61.85	18.75	68.58					N.	10	6	7		1	8	1							
	Maximum	29.85	29.84	29.85				80.00	92.50	80.00	78.00	83.75	74.17	32.37	78.00	Ent. clr	29	12	34	N.W.	13	16	15		9	11	3							
																				N. E.	11	11	10		5	5	0							
	Minimum	29.27	29.25	29.21				57.00	63.00	58.00	54.00	62.50	45.58	0.00	59.00	Ent.cld	24	11	18	S.	12	19	10		1	5	0							
																				S. W.	23	15	23		15	11	3							
	Range	.58	.59	.64				23.00	29.50	22.00	24.00	21.25	28.59	32.37	19.00	Prt. clr.	39	68	39	S. E.	15	5	19		1	6	0							
																				W.	4	15	6		19	29	6							
																				E.	4	4	2		2	5	1							
Omitted			1	1					1	1		1	1	1	1				1	1			1	0		14	8	45		9.020					
		Average of Autumnal Months, 1841.														*Total of Autumnal Months*, 1841.																	
Autumn, 1841.	Average	29.50	29.47	29.48	50.09	58.97	52.77	47.34	59.18	49.50	45.32	52.16	47.68	11.21	53.29					N.	14	9	12		1	8	0							
	Maximum	29.96	29.90	29.91				71.50	88.00	77.50	71.50	78.25	73.50	24.63	74.00	Ent. clr	28	9	39	N. W.	18	28	20		13	15	3							
																				N. E.	12	9	15		1	3	0							
	Minimum	28.93	28.90	28.97				17.00	30.00	21.00	16.00	25.75	16.62	0.00	27.00	Ent.cld	30	23	23	S.	6	14	9		0	5	0							
																				S. W.	22	15	14		8	9	4							
	Range	1.03	1.00	.94				54.50	58.00	56.50	55.50	52.50	56.88	24.63	47.00	Prt. clr.	33	56	28	S. E.	6	4	8		1	1	0							
																				W.	8	5	8		16	21	3							
																				E.	5	4	4		0	4	0							
Omitted			3	1					3	1		3	3	3	3			3	1			3	1		23	17	42		7.162					

Mechanics' Register.

LIST OF AMERICAN PATENTS WHICH ISSUED IN FEBRUARY, 1841.

With Remarks and Exemplifications by the Editor.

1. For an improvement in the *Jacquard Machinery for Weaving all kinds of figured goods;* Alexander Calderhead, city of Philadelphia, February 3.

The patentee says—"The nature of my improvement consists, first, in lifting and lowering the threads of the warp with what I call independent metallic heddles, or heylds, instead of the weights, males and twines composing the lower mountings, or harness, of the draw loom. Second—In constructing the cylinder, or pattern, so as to directly lift and receive the said heddles, to form the sheed, or shive; or in constructing a trunk and pattern web, both to direct what shall be the sheed as it does in the Jacquard and other drawing machines by trapping or untrapping the hooks, or knot cords, to be drawn up."

"I claim, as my invention, the principle of lifting the sheed, or shive, with metallic heddles directly by the pattern apron and trunk, roll or receiver, or by lowering the heddles into the same, as described."

2. For a machine for *Manufacturing Cannon Balls, Bullets, and other kinds of Shot* from malleable iron; Lewis Grandy and Thomas Osgood, city of Troy, Rensselaer county, New York, February 3.

"The metal from which the ball, or bullet, is to be made by means of our machine, is first to be formed into round bars of a size adapted to the kind of shot to be formed. When these are to be made of malleable iron, the metal must, preparatory to its being passed into the machine, be brought to a degree of heat nearly equal to that requisite for welding, in a suitable forge, or furnace, prepared for that purpose. When the balls, or bullets, are to be made from lead, or other soft metal, the heating process is omitted. The machine consists of suitable cutters for cutting off the proper quantity of metal from the bar to form a single ball, or shot, and of an apparatus for receiving the piece so cut off, and rolling it into the spherical form. The rolling is effected by means of channeled pieces of cast iron, or steel, which we will denominate swages. The channels in these, when the swages are made straight, are semi-cylindrical, and by placing swages in pairs, one over the other, with their channels coinciding, a cylindrical cavity is thereby formed. These swages may be either straight or circular; and to one, or to both, of each pair, a longitudinal, reciprocating, or a revolving, motion, as the case may be, must be communicated by suitable machinery.

"Having thus fully described the nature of our machine for manu-

facturing ball and shot, and shown the manner in which the same operates, we do hereby declare that we do not claim either of the separate parts thereof as of our invention, nor do we intend to limit, or confine ourselves to the particular manner of connecting or giving motion to the respective parts, but to use any of the devices, or means, for effecting these objects known to machinists; but what we do claim as constituting our invention, is the manner in which we have combined the cutting apparatus for separating the pieces of metal from the bars, with the reciprocating straight swages, or with revolving swages, or with straight and revolving swages combined, in such manner as that the pieces of metal cut off and to be rolled into balls, shall pass successively between two or more pairs of swages, in a machine constructed and operating substantially in the manner of that herein described."

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3. For an improvement in the manner of forming *Blocks of Wood for Pavements;* Stephen Carey, New Orleans, Louisiana, February 3, 1841. Patented for fourteen years from the 29th of January, 1839, the date of the English Patent.

"In forming my blocks for paving, I first cut them rectangularly, taking squared timber, generally of from nine inches to a foot, more or less, on each side, which timber I cross-cut into such lengths as may be thought suitable, according to the climate and other circumstances; these lengths, varying usually from nine to sixteen inches, those of the greatest length being required in climates where the ground is subject to be frozen to a considerable depth. The rectangular blocks, prepared as above described, are to be sloped, or beveled, on each of their four sides, said slopes or bends meeting at, or near, the middle of the length of each block, in consequence of which they become either wider or narrower in their measurement across the middle of each of their faces, than they are at their ends. In preparing my blocks I give to them three different forms, these being all that are necessary to their being combined together; one of these forms being that which would result from the uniting of two truncated rectangular pyramids by their larger ends; a second form is that which would be produced by joining such truncated pyramids by their smaller ends; and the third is a combination of the other two forms, two of its opposite sides having the first, and its other two sides the second forms."

Claim.—"Having thus fully described the manner in which I form and combine my blocks for the construction of pavements, what I claim as constituting my invention, and desire to secure by letters patent, is the giving to their sides, where they come into contact with each other, concave and convex faces, alternately, in the manner herein fully set forth, by which mode of forming and combining them they are each supported by, and aid in supporting, the surrounding blocks, as described; it being distinctly understood that when one side of a block is convex its opposite side is so likewise, and vice versa."

4. For improvements in the machine for *Splitting Leather, or Green Hides;* Alpha Richardson, Boston, Massachusetts, February 9.

The above named patent is for improvements on the machines that split the leather by means of a vibrating knife.

The gauge roller, which is placed above the knife to gauge the thickness of the grain side of the leather, works on pivot screws at each end, that pass through two arms projecting from a tubular shaft, within which a shaft revolves to communicate motion to the gauge roller by means of two chain bands, one at each end, that pass through openings in the tubular shaft. The table, or bed, against which the cutting is effected, rests on springs, and on its upper surface there is a revolving, elastic, steel rod, against which the flesh side of the leather is borne, and which yields to the inequalities in the surface of the leather. The split leather, or skin, is drawn through, to feed the machine, by means of three rollers geared together.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the manner in which I have combined the gauge roller, the shaft by which it is driven, and the tubular shaft, so as to give the revolving motion to the gauge roller by means of the chain bands. I claim, also, the use of the elastic steel rod, in combination with the elastic plate, or table, arranged and operating as described. I claim, likewise, the combining with such a machine, the drawing, or feeding rollers, operating in the manner, and for the purpose set forth. I do not claim to have invented any thing new in the general mode of gearing or of employing springs, and adjusting screws, these being common to machines used for the same, and for other purposes, but I confine my claim to the particulars above stated, with such variations thereof as will be substantially the same, producing a like effect by analogous means."

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5. For improvements in *Smelting Iron Ores;* Charles Sanderson, Sheffield, England, February 9.

"The object of my invention for certain improvements in the art or process of smelting iron ores, is to separate the scoria, slag, or other earthy or extraneous matters, from the metallic parts of such ores in a better and more economical manner than is commonly practiced in the smelting of iron ores, and the invention embraces a novel or improved manner, or method, of treating or operating upon such ores, whereby I am enabled to separate and remove the scoria, or earthy matters, contained therein, from the metallic parts, without the necessity of carbonizing the metallic parts so thoroughly as to cause them to melt together into a fluid state as they do in the common blast furnace; but my method consists in carbonizing the metallic parts to that extent which will enable them to separate from the scoria during the process of melting, whereby I am enabled to separate the metallic parts from the scoria without the necessity of melting both at the same time into a fluid state and running off the fluid iron from the scoria, or slag, as is the usual practice in the blast furnace; that is to say, I so treat and operate upon the ore, that I reduce the scoria, or other

extraneous matters contained therein, to a fluid state, so that the same will separate from the metallic parts and run off, leaving the metal without its changing into a fluid form—but in a sort of pasty consistency and in a fit state to be removed from the furnace, and applicable to various purposes, particularly to the making of bar iron."

The claims refer throughout to numerous drawings, and are therefore omitted.

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6. For improvements in *Locomotive Engines for Railways;* Henry Waterman, city of Hudson, Columbia county, New York, February 9.

The character of this invention is given with sufficient clearness in the claims made, which are as follows: "What I claim as my invention, and desire to secure by letters patent, is the particular mode of connecting the rear and front driving wheels by means of jointed rods placed at each end of said axle, so constructed as to enable the wheels to have a lateral and vertical motion to enable them to accommodate themselves to the curvature of the track, and pass over whatever obstacles may intervene without danger to the engine. And in connecting the main boxes of the main driving axle to the base of the cylinder, or other convenient place, by jointed rods so as to hold them firmly, and thus resist the strain on the axle and joints of the ordinary frame produced by the oscillating action of the pistons and their connexions; and thereby to dispense with the usual frame and pedestals, which, with the boxes, are constantly liable to wear, from the causes before stated; and I claim the above mentioned improvements whether they are effected in the manner herein set forth, or in any other mode substantially the same, and the last named improvement to be applied also to engines having but one pair of driving wheels."

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8. For an improvement in the machine for *Scraping Skins, or Hides, preparatory to Tanning;* Reuben Shailer, Haddam, Connecticut, February 9.

This improvement was added to a patent granted to Reuben Shailer on the 19th of June, 1837, noticed in this Journal, vol. xvii, 2nd series, p. 178. The improved apparatus consists of a cylinder with knives, scrapers, stones, or brushes, on its surface, against which the skin is pressed by means of a piece of leather attached to a hinged frame.

Claim.—"Having thus fully described the nature of my improvements in the within described machine for unhairing, scraping, and performing other analogous operations upon hides and skins, what I claim therein, and desire to secure by letters patent, is the affixing of the knives, scrapers, or other instruments, on to the periphery of a cylinder, in combination with a hinged frame sustaining a piece of leather, or other yielding material, the whole being constructed, arranged, and operating substantially in the manner herein set forth."

8. For improvements in *Piano Fortes;* Timothy Gilbert, Boston, Massachusetts, February 10.

Without the drawings we could not give a clearer idea of these improvements than will be conveyed by the claim alone, which is as follows:

Claim.—"Having thus described my improvements I shall claim the above arrangement of the parts of the action by which the spring after the strings are struck by the hammers performs the three operations of throwing back the hammer and preventing its recoil, throwing forward the damper upon the strings, and depressing the rear end of the key lever, consequently raising the opposite, or key, end; the whole being constructed and operating substantially as herein set forth. I also claim the mode of adjusting the end, or cloth, of the damper to the string, by means of a piece of wood, or spring, applied to the rear end of the key lever, and raised or lowered by a screw; and also the mode of adjusting the height of the jack by a similar contrivance applied to the same end of this key lever, the whole being arranged substantially as above described."

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9. For an improvement in the *Hammer Heads of Piano Fortes;* Timothy Gilbert, Assignee of Edwin Fobes, Boston, Massachusetts, February 10.

Claim.—"I claim forming the top of the hammer heads of piano fortes of cork, over which the soft buff leather, or striking part of the head, is to be stretched and confined in the usual manner."

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10. For an improvement in the *Cocks of Hydrants;* Ebenezer Hubball, Assignee of Joseph Martin, city of Baltimore, February 10.

The improvement is in the mode of raising the valve from its seat, which is effected by means of a screw-cap, turned by a winch, which works on a screw cut on the upper end of the valve rod.

Claim.—"The invention claimed, and desired to be secured by letters patent, consists in lifting the valve vertically, without any horizontal or grinding movement on its seat, by means of the before described revolving screw-cap and screw-head piston (valve) rod, whether constructed and arranged precisely in the manner above described, or in any other mode substantially the same."

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11. For improvements in *Clocks;* Aaron D. Crane, Newark, New Jersey, February 10, 1841; antedated December 22, 1840.

This clock, instead of being regulated by the vibrations of a pendulum, is regulated by the twisting and untwisting of a narrow strip of steel, to the lower end of which, a spherical weight is suspended. The twisting and untwisting of the strip of steel, which constitutes the pendulum rod, is effected by an arrangement of levers connected with the escapement wheel, but in a manner not easily explained in words without drawings. A rotary hammer, also, is employed in the striking

part, instead of the ordinary reciprocating hammer; this hammer is hung by a joint pin to the upper end of a vertical spindle, and is provided with a counter weight to balance it—both the hammer and counter weight, when lying horizontally, may rotate under the bell without striking it, but immediately in front of the bell there is a short inclined plane, which elevates the hammer sufficiently to cause it to strike as it approaches the bell, and then permits it to fall.

The time, or watch, part is driven by a spring, which is wound up by the striking of the clock, and the striking part is driven by a large spring, which is to be wound up in the usual way. On the arbor of one of the wheels in the train of the striking part, there is a barrel containing the spring of the time part, which barrel is connected with the train of the time part; this spring is attached to the arbor of the wheel in the striking train, and its other end forms the connexion with the time part by friction against the inner periphery of the barrel; when the clock strikes, this spring will consequently be wound up, and any excess of winding will be counteracted by the slipping of the spring on the inner periphery of the barrel.

Claim.—"The invention claimed, and desired to be secured by letters patent, is: first, the rotary pendulum; second, the rotary hammer in the striking part of the clock, and thirdly, the connection between the striking and time part of a clock, by which the time part is driven, all as described, and for the purpose above set forth."

In the construction of this time piece there is considerable ingenuity displayed, but we apprehend that the skill of the inventor would have been more profitably directed in the improving and manufacturing of clocks operated by the ordinary pendulum, which his tortion pendulum is hardly destined to supersede.

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12. For an improvement in the *Weighing Apparatus;* Christopher Edward Dampier, Ware, England, February 12.

A wheel or disk is hung by its axis to a suspended frame, provided with a pointer to indicate the graduations of pounds, &c., marked on the disk, as it turns under the action of the weights. A weight is attached by a joint pin to one disk, and on its opposite edge is the zero mark, from which commences the scale of pounds, and of parts thereof; the parts being so arranged as that when the whole is suspended, the weight shall be at the bottom, and zero under the pointer just above it. The dish, or scale, is hung to the edge of the wheel at right angles to the line, or diameter, running through the weight and zero of the scale. By attaching a lever to the disk in the line of its centre, the weights and dishes can be hung at different distances from the centre, and it thus acts as a steel yard, in addition to the constantly increasing weight or scale.

Claim.—"Now whereas, I claim as my invention, the application of a geometric scale, formed on the principle of the rules herein before given to a circular plate or disk, such plate or disk acting at the same time as a bent lever, and an equipoised balance beam for weighing

matter in the manner herein before described, and as an index of the weight so ascertained. And I claim also as my invention, the combination in operation of the aforesaid disk, acting as a bent lever, and the simple lever or steel yard as described, for ascertaining the weight of substances applied thereto, by means of graduated scales, as herein before mentioned, extending the operation of the disc acting as a bent lever to greater weights than marked upon the disc by means of the simple lever, or common steel yard."

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13. For an improvement in the *Corn Sheller;* Nicholas Goldsborough, Easton, Talbot county, Maryland, February 12.

This corn sheller consists of a cylinder armed with teeth in the usual way, which act in conjunction with a concave in stripping the grain from the cob. The concave is formed of a series of fluted iron rollers, twisted so as to make the flutes spiral; these are arranged in a frame hung on springs, within the frame of the machine.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the concave, consisting of revolving, twisted, fluted bars, and hung upon springs, in combination with the toothed cylinder, for the purpose and in the manner above specified."

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14. For an improvement in the *Plough;* Benjamin F. Jewett, Springfield, Sangamon county, Illinois, February 12.

The mould board of this plough is fastened to the sheath by rivets, which are cast with the sheath. The claim is confined to this mode of fastening the two parts together.

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15. For an improvement in the manner of constructing *Door and other Locks;* Solomon Andrews, Perth Amboy, Middlesex county, New Jersey, February 12.

The patentee says—"I denominate this lock 'the combined snail wheel lock,' which name is given to it on account of its principal characteristics being the causing of the key to carry around with it any desired number of wheels formed of flat plates of metal, which wheels revolve upon a centre pin, and are each of them perforated with a snail-like, or other suitably formed opening, within and upon which the bit of the key is to act."

The snail-like openings in all the wheels are alike, and the key is formed with projections on the bit of different lengths, one for each wheel, and as the key is turned, the projections being of different lengths, they will act upon the snail-like openings at different parts, and then carry the wheels around. Each of these wheels is provided with a recess so situated, as that when the projections on the bit of the key are all in contact with the wheels upon which they act, the recesses will all correspond, and receive the end of a pendulous lever, which is set in motion by the continued turning of the wheels, by which means the bolt of the lock is shot forward.

Claim.—"What I claim as new, and desire to secure by letters patent, are the use and employment of said combined wheels, having in them openings similar to those herein described, which wheels are to be operated upon within the snail-formed, or other, openings, and carried round to different distances by projecting pieces on the bit of the key, until a notch, or cavity, on the periphery of each wheel is brought to coincide with those on the other wheels with which it is combined, so as to admit of the opening of the lock, in the manner, or upon the principle, above set forth."

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16. For an improvement in the *Cooking Stove;* Clark Robinson, Union Town, Fayette county, Pennsylvania, February 13.

There is in this stove an arrangement of flues and dampers, by which the draught may be carried around the four sides of the oven in two different directions. The oven is below the fire chamber, and extends beyond it at the back of the stove, the plate that covers the flue at this part being provided with boiler holes, in addition to those directly over the fire. The chimney is situated behind the fire chamber, and over that part of the oven which extends in the rear of it. The bottom plate of the fire chamber does not extend to the back plate, and the intervening space is covered by a damper hinged to the back plate, and shutting down on a flanch on the back edge of the bottom plate. The back plate of the fire chamber is provided with four apertures, one on each side of the chimney, leading into the back flue, and two leading into the chimney, one of them above, and the other below, the bottom plate. From the above arrangement, it follows that, when the damper, which covers the opening in the bottom of the fire chamber, is thrown up, and thus closes the aperture in the back above the bottom plate, the smoke, &c., will pass out through this opening over the oven, down the front, along under the bottom, up the back, over so much of the top as extends back of the fire chamber, and then out at the chimney. When the damper is down and closes the opening in the bottom of the fire chamber, and the aperture leading into the chimney above the bottom of it, which is used only when kindling the fire, is closed, and the lower one leading into the chimney, and the two leading into the back flue are open, and the bottom of the chimney is closed; the smoke, &c., will then pass out from the fire chamber into the back flue, down the back, under the bottom, up the front, over the top, and then out into the chimney.

Under the hearth, and against the plate which forms the front flue, there is a square box, constituting an apparatus for roasting coffee, &c.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the before mentioned arrangement, to give the flame, &c., any direction, forward or backwards, round the oven, by means of flues and dampers connected therewith, and the additional apparatus which is heated by the oven and hearth for roasting coffee, and for using as a spit as described."

17. For an improvement in the *Press for compressing Cotton, &c.;* Lemuel Bolles, Jedediah Prescott, and William A. Bickford, Memphis, Shelby county, Tennessee, February 13.

There is in this press a combination of jointed levers, press-blocks, a rack and pinion, and other devices, connected in such a manner as not to admit of a description in words alone, and the claims, which refer throughout to the drawings, would not convey any idea of the particulars of the invention.

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18. For an improvement in the mode of *Applying water to Fire Engines,* so as to render their operation more effective; Franklin Ransom and Uzziah Wenman, city of New York, February 13.

The pressure of a column of water, either from a reservoir or a hydrant, is to be applied by a pipe, or hose, to the cylinder, or cylinders of a fire engine, so that the pressure of the column may assist the power, or force, applied to the brake or levers.

Claim.—"What we claim as our invention, and wish to secure by letters patent, is the employing of the pressure of a column of falling water, or the tendency of the hydraulic pressure on water at rest, to assist in the working of fire engines, by combining a hose or pipe, conducting said water with the receiving tubes of an engine or pump, operated by animal or mechanical power, the same being constructed substantially in the manner set forth."

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19. For an improvement in the *Parlor Stove;* John Backus and Evans Backus, New York city, February 18.

The patentees say—"The nature of this stove consists in a combination of the radiator and the hollow base, by which combination the smoke is made to descend through the sides or ends of the stove into the hollow base, and to ascend thence through a draught pipe at the back of the stove; and while in this passage the smoke heats the air, which is constantly passing through the radiators, which are open at bottom and top, to allow free way for the atmosphere of the room."

"What we claim as our invention, and desire to have secured to us by letters patent, is the combination of the hollow base and the radiators."

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20. For an improvement in the *Fire Engine;* Asa Barrett, city of Baltimore, February 18.

The patentee observes that "the usual manner of ejecting water from the engine, is by means of the goose-neck pipe, which is from five to eleven feet long; the bore having a uniform taper through its whole length. Whereas, I contract the length of the joints and the eject-pipe to the short length of from fourteen to seventeen inches: the eject-pipe itself being from three to six inches long." To a pipe, connected with the engine by the usual lower joint of the branch pipe. (which the patentee calls the eject pipe,) a short cylinder is attached

at right angles to the length of the pipe. The branch pipe, which is very short, is attached to a cylinder which turns within that first named, the branch pipe passing through a slot in it of sufficient length to allow the pipe to play through a range of a quarter of a circle: the inner cylinder has a long opening in it to admit the water from the main pipe. The inner cylinder is provided with gudgeons at each end, that pass through the heads of the first mentioned cylinder, and these have a lever attached to them for the purpose of governing the elevation of the branch pipe.

Claim.—"I claim as my invention, and desire to secure by letters patent, the combination of the eject-pipe as above described, with a compact universal joint-pipe or duct, managed by a handle or lever, all constructed in the manner, and for the purpose above specified."

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21. For improvements in the machine for making *Cotton Roping*, commonly called "Counter twist Speeders;" Charles Danforth, Paterson, Passaic county, New Jersey, February 18.

Those who are acquainted with the operation of speeders will fully understand this invention from the following claim, viz:—"What I claim as my invention, consists of the following arrangement, viz: the turning of the cylinder which bears and drives the bobbins in a direction which makes the roping run on to the bobbins at the point of contact or bearing, between the bobbins and the said driving cylinder, the roping being made to pass between the condensing belt, or through the condensing tube, to said point of contact, in the direction of a tangent to said driving cylinder, whereby the bobbins take the roving at such a distance from the nearer edge of the said belt or tube, as to be within the length of the fibre, and thereby the roping is not liable to be strained after passing upon the bobbin, as may be the case in machines, which deliver the roving through guides to the top or sides of the bobbins; the guides in my machine being made to deliver the roping filament to the condensing belt, and this being placed on a line with the top of the driving cylinder, so as to deliver the roping as near as may be in the direction of a tangent, as aforesaid."

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22. For improvements in machinery for *Trimming Straw Braid;* Henry H. Robbins, Middleborough, Plymouth county, Massachusetts, February 18.

This machine is for the purpose of trimming the long and the short ends of straw left on the two surfaces after braiding, the short ends being left on one side, and the long ends on the other.

The claim presents the general arrangement of the parts of this apparatus as clearly as can well be done, without a drawing.

Claim.—"I claim as my invention, the combination of a revolving circular saw with a riser, (so called) and a spring and gauge, the whole being arranged and operating substantially as herein above described, for the purpose of separating the long ends from the braid; and I also claim separating the short ends from the braid on the opposite side of

the same, by means of a circular saw in combination with a small metallic roller, bed knife and gauge, the arrangement and operation being substantially as specified."

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23. For an improvement in the *Nurse Bottle*, denominated a Lacteal or Artificial Breast; Charles M. Windship, Roxbury, Norfolk county, Massachusetts, February 18.

"The great objection to the common nursing bottle is, that it is exceedingly difficult to teach most infants to use them, and with many it is altogether impracticable. The peculiar formation of my lacteal breast remedies this objection and enables me to practice a useful deception, viz: inducing the child to think that it derives its nourishment directly from the mother, as it feeds in the natural position."

The bottle is made concave on the under side to rest on the breast, and on the upper side swelled out in form of the natural breast, with a neck in the middle, in the form of a nipple, and a tube at one side through which the milk is introduced.

Claim.—"I shall claim as my invention a nurse-bottle, shaped and curved in its several parts, so as to be used at the breast, and formed with a neck and mouth substantially as described. And I also claim in combination with the above, an artificial nipple, composed of sponge and wash leather, the whole forming what I denominate a lacteal or artificial breast, as above specified."

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24. For improvements in the *Press for filling War Rockets;* Alvin C. Goell, Washington city, District of Columbia, February 18.

"What I claim as constituting my invention in the above press, and desire to secure by letters patent, is the manner of combining a system of weighted levers with a screw, by causing a piston, or rod, to extend through a tubular opening in said screw, the lower end of said piston, or rod, acting against a follower, rammer, or other device analogous thereto in character and use, and its upper end acting upon a system of compound levers, by which the actual amount of pressure made may be ascertained and determined, substantially in the manner, or upon the principle, set forth. I also claim the manner of combining two, or more moulds, to be alternately brought under the pressing screw and piston, by the revolution of the basis on which they are situated, so that those not under the press, may be prepared for its action during the time of making pressure upon that which is in the proper situation."

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25. For an improvement in the *Cooking Stove;* Jefferson Cross, Morrisville, Madison county, New York, February 18.

The improvement referred to is added to a patent granted to the same person on the 27th of June, 1838, and noticed in this Journal, vol. xxiii, 2nd series, p. 400.

The patentee says—"In my stove, as originally constructed, there was a cylindrical elevated oven which was supported on two pillars,

or pipes, about one foot five or six inches in length, and when baking was to be effected, the heated air from the fire was allowed to pass up through these pipes and to circulate around the oven, as in some other stoves with elevated ovens. For carrying the draught directly into the main flue, when the oven was not to be used, it was led off by a flue projecting about one foot backwards from the body of the stove. By my present improvement I dispense with the pipes, or tubes, which sustained the oven, and conducted the heated air into the flue surrounding it; said oven being elevated above the top plate of the stove but little more than its diameter. I have also arranged the flue for carrying off the smoke and heated air in such manner as to change the direction of the draught by the action of a single valve, or damper, instead of by three, as in my former plan. The oven flue and stove flue communicate with each other through an opening nearly the whole length of the oven. Directly in front of the oven a pipe extends from the stove flue to a box above the oven, (the upper plate of which is provided with boiler holes) which communicates with the upper part of the oven flue and with the chimney; where the oven flue runs into the box it is provided with a damper to direct the draught either through the oven flue or through the front pipe, under the boilers, in the top plate of the box."

"What I claim, and desire to secure by letters patent, is the manner in which I have combined the elevated oven with the stove, by admitting the draught from the fire to pass from the stove directly into the oven flue through an opening extending nearly the whole length of the oven, as set forth. I also claim the manner of arranging and combining the flue, (pipe in front of the oven,) the box, and the valve, so as to direct the draught, by the shifting of said valve, either around the oven or through the pipe, for the purpose, and substantially in the manner, herein described."

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26. For an improvement in the *Machine for Inking Types;* Frederick J. Austin, city of New York, February 20.

This patent is taken for an alleged improvement in the well known inking apparatus of the printing press, and consists in an arrangement of levers, &c., for moving the inking roller over the form.

An arm extending from the sliding frame that carries the inking roller, is jointed to a lever attached to an arbor, from which projects another and shorter lever, at right angles to the first. The last mentioned lever is connected by means of a connecting rod, with a crank, the shaft of which is provided with a pulley and weight, by which the roller, when liberated, is moved over the form of types.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the peculiar mode of throwing the roller across the form by means of the lever and connecting rod combined and attached to the crank on the shaft of the pulley; said pulley being operated upon by the weight."

27. For an improvement in *Grinding Mills;* Ezekiel G. Ward, city of New York, February 20.

This grinding mill is a modification of the cast iron mill, the runner of which operates vertically. The improvements are clearly explained in the following claim, viz:—

"I am aware," the patentee observes, "that mills have been made with the grinders revolving vertically, and that the grinders of mills have been made so that they shall be removed from the shaft, and these I do not therefore claim as my invention; but what I do claim as my invention, and desire to secure by letters patent, is the manner in which the grinders are connected with the case and shaft so that they can be removed with pleasure and without injury to any part of the mill; that is to say, I claim connecting the front grinder with the case by means of the steps fitting into notches in the mill case, in combination with the method of attaching the back grinder to the shaft by means of the flanch on the shaft having notches into which fit steps projecting from the back of the grinder, the shaft passing through the two grinders by which they are centered, and the grinding being regulated by pressing the flanch against the back of the back grinder, all as described."

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28. For an improvement in the *Stump Extractor;* Belden B. Mason, Randolph, and Mathews Joslyn, Napoli, Cattaraugus county, New York, February 20.

The improvement here patented is on that kind of stump machine in which the stump is extracted by means of a screw attached to it by means of chains, and passing through a nut attached to the upper part of a frame.

The patentee says—"We do not claim as our invention the method of extracting stumps by means of a screw passing through the nut in the upper part of the frame, as this has been before effected; but in these cases the nut being permanently and immovably fixed to the frame, the screw was liable to be bent, and therefore what we claim as our invention, and as an improvement on such a machine, is the employment of the semi-spherical nut and socket in combination with the screw and chain by which the stump is griped, for the purpose and in the manner specified."

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29. For an improvement in *Head Blocks for Saw Mills;* James King, Sapling Grove, Washington county, Tennessee, February 20.

The object of the improvement in the head blocks of saw mills, is the gauging the thickness of the board to be cut, and this is to be effected by means of a block of wood furnished with a slot, through which a screw bolt passes to fasten it to the head block, and to allow it to slide towards, or from, the saw. The distance of this block from the saw is regulated by a wedge which is driven in between it and a standard attached to the head block.

Claim.—"I am aware," the patentee observes, "that the head blocks

of saw mills have been provided with a sliding gauge for gauging the thickness of the board to be cut, and that the slide has been moved by a screw passing through a standard and acting on the sliding gauge, and that it has also been connected with a hinge frame by means of screws passing through a slot in the slide to allow of its sliding nearer to, or further from, the saw, and therefore I do not claim all this as of my invention; but what I do claim as my invention, and desire to secure by letters patent, is the peculiar manner in which I have constructed and combined the various parts, that is to say, I claim the sliding'block, provided with a slot through which the screw bolt passes, to fasten it to the head block, in combination with the standard, the space between the two being occupied by a wedge to determine the thickness of the board to be cut, as described."

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30. For an improvement in the manner of *Fastening Bedsteads;* Hermann C. Ernst, Vandalia, Fayette county, Illinois, February 23.

In the improved mode of fastening, which is the subject of this patent, the posts are to be attached to the rails by a piece of cast iron, somewhat in the form of an anchor. That part which corresponds to the stem is round, and is received in a hole in the inner corner of the post, and each end of the head is provided with a round tenon, which is received in a hole made in the inner side of the rail. There are also two square tenons on the stem, within the anchor head, which fit into mortises in the rails, and come against the two inner sides, or faces, of the post.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the application of the casting nearly in the shape of an anchor, for the purpose of confining the rails and posts of bedsteads to each other."

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31. For an improvement in *Making Brushes;* Robert B. Lewis, Hallowell, Kennebeck county, Maine, February 23.

This patent is for a mode of attaching the bristles, &c., to the handles of brushes for white washing and for such other purposes as require brushes to be wide and thin. The bristles are placed on each side of a double champfered bar, and are then confined by a metallic band, made in two parts and jointed at each end. In this manner the bristles are confined by being pinched between the side plates, or band, and the champfered bar.

Claim.—"Having thus described my improvements, I shall claim as my invention as follows, viz:—Confining the bristles in a brush (more effectually than before) by means of a double champfered bar, (whose section would be elliptical and on which the bristles are placed,) in combination with the metallic band, which is formed of two parts united by joints and pins, as described, the whole being arranged substantially in the manner and for the purpose set forth."

32. For improvements in *Machinery for Manufacturing Ploughs;* Draper Ruggles, Joel Nourse, and John C. Mason, Assignees of Elbridge G. Matthews, Worcester, Massachusetts, February 23.

The inventor says—"The nature of my invention consists in giving, by appropriate machinery, a uniform tenon and shoulder to the beam of each sized plough without the use of square, compass, or level; a method of cornering the beams in a manner befitting each size, and also a method of setting out the mortise in the handle and bringing all the parts together with an accurate fit, in conformity with such preparatory operations; altogether tending to the result above mentioned."

The claims refer throughout to the drawings, and could not be understood without them.

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33. For an improvement in the manner of *Fastening and Combining the Truss Frames of Bridges,* and which may be applied to other purposes; Jehu Price and James T. Phillips, Golden Post Office, Baltimore county, Maryland, February 23.

We make the following extract from the specification, viz:—"The peculiarity in the manner of fastening our truss frames and combining them with each other, consists in the employing of the pieces of timber last inserted in putting together the truss frame, in such a way as to cause them to operate as keys, and to bind the whole frame together without its being necessary to use pins, tree-nails, bolts, wedges, or other devices analogous thereto, excepting for fastening down the floor timbers, or such as may be employed in covering in. From the circumstance of these last inserted timbers keying the whole together in a manner similar to the binding together of the toy sometimes called a 'puzzle knot,' we have denominated our bridge the 'Puzzle Keyed Bridge.'"

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the within described manner of fastening, and combining together the truss frames of bridges, or of other structures, by the insertion of timbers which constitute key pieces, or cross ties, as set forth, so as to obviate the necessity of using pins, tree-nails, screw-bolts, or other analogous devices."

Report from the Commissioner of Patents, showing the operations of the Patent Office during the year 1841.

PATENT OFFICE, *January,* 1842.

SIR: In compliance with the law, the Commissioner of Patents has the honor to submit his annual report.

Four hundred and ninety-five patents have been issued during the year 1841, including *fifteen* additional improvements to former patents; of which classified and alphabetical lists are annexed, marked A and B.

During the same period, *three hundred and twenty-seven* patents have expired, as per list marked C.*

The applications for patents, during the year past, amount to *eight hundred and forty-seven;* and the number of caveats filed was *three hundred and twelve.*

The receipts of the office for 1841 amount to $40,413.01; from which may be deducted $9,093.30, repaid on applications withdrawn.

The ordinary expenses of the Patent Office for the past year, including payments for the library and for agricultural statistics, have been $23,065.87; leaving a surplus of $8,253.84 to be credited to the patent fund, as per statement marked E.

For the restoration of models, records, and drawings, under the act of March 3, 1837, $20,507.70 have been expended, as per statement marked F.

The whole number of patents issued by the United States, previous to January, 1842, is *twelve thousand four hundred and seventy-seven.*

The extreme pressure in the money market, and the great difficulty in remittance, have, it is believed, materially lessened the number of applications for patents. These have, however, exceeded those of the last year by *eighty-two.*

The resolution of the last Congress, directing the Commissioner to distribute seven hundred copies of the Digest of Patents among the respective states, has been carried into effect, as ordered.

Experience, under the new law reorganizing the Patent Office, shows the importance of some alterations in the present law. One difficulty has been hitherto suggested, viz: the want of authority to refund money that has been paid into the Treasury for the Patent Office, by mistake. Such repayment cannot now be made without application to Congress. The sums, usually, are quite small, not exceeding $30. A bill has been heretofore presented, embracing these cases, and passed one House of the National Legislature; but a general law would save much legislation, and be attended with no more danger than now attends the repayment of money, on withdrawing applications for patents. Indeed, several private petitions are now pending before Congress, and are postponed, to wait final action on the bill which has been so long delayed.

Frauds are practised on the community by articles stamped "patent," when no patent has been obtained; and many inventors continue to sell, under sanction of the patent law, after their patents have expired. To remedy these evils, the expediency of requiring all patentees to stamp the articles vended with the date of the patent, and punishing by a sufficient penalty the stamping of unpatented articles as patented, or vending them as such, either before a patent has been obtained or after the expiration of the same, is respectfully suggested. Almost daily inquiries at the Patent Office exhibit the magnitude of such frauds, and the necessity of guarding effectually against them.

The justice and expediency of securing the exclusive benefit of new and original designs for articles of manufacture, both in the fine and

* For list marked C, see page 281; the others are omitted.

useful arts, to the authors and proprietors thereof, for a limited time, are also respectfully presented for consideration.

Other nations have granted this privilege, and it has afforded mutual satisfaction alike to the public and to individual applicants. Many who visit the Patent Office learn with astonishment that no protection is given in this country to this class of persons. Competition among manufacturers for the latest patterns prompts to the highest effort to secure improvements, and calls out the inventive genius of our citizens. Such patterns are immediately pirated, at home and abroad. A pattern introduced at Lowell, for instance, with however great labor or cost, may be taken to England in twelve or fourteen days, and copied and returned in twenty days more. If protection is given to designers, better patterns will, it is believed, be obtained, since the impossibility of concealment at present forbids all expense that can be avoided. It may well be asked, if authors can so readily find protection in their labors, and inventors of the mechanical arts so easily secure a patent to reward their efforts, why should not discoverers of designs, the labor and expenditure of which may be far greater, have equal privileges afforded them?

The law, if extended, should embrace alike the protection of new and original designs for a manufacture of metal, or other material, or any new and useful design for the printing of woolen, silk, cotton, or other fabric, or for a bust, statue, or bas-relief, or composition in alto or basso-relievo. All this could be effected by simply authorizing the Commissioner to issue patents for these objects, under the same limitations and on the same conditions as govern present action in other cases. The duration of the patent might be *seven* years, and the fee might be *one-half* of the present fee charged to citizens and foreigners, respectively.

On the first alteration of the patent law, I would further respectfully recommend, that authority be given to consuls to administer the oath for applicants for patents. Inventors in foreign countries usually apply to the diplomatic corps, who are willing to aid any, and have uniformly administered the usual oath prescribed by the Commissioner of Patents; but as the Attorney General has decided, that consuls cannot, within the meaning of the patent law, administer oaths to inventors, a great convenience would attend an alteration of the law in this respect.

It is due to the clerical force of the office to say, that their labors are arduous and responsible—more so than in many bureaux—while the compensation for similar services in other bureaux is considerably higher. A comparison will at once show a claim for increased compensation, if uniformity is regarded. The chief and sole copyist of the correspondence of this office receives only eight hundred dollars per annum.

The Commissioner of Patents also begs leave to suggest the expediency of including the annual appropriations for the Patent Office in the general bill which provides for other bureaux. Objections hitherto urged against this course, inasmuch as the Patent Office is embraced by a special fund, have induced the committee to report a spe-

cial bill, which, though reported without objection, has failed for two sessions, because the bill could not be reached, it having been classed with other contemplated acts on the calendar, instead of receiving a preference with other annual appropriations so necessary for current expenses. Were the appropriation for the Patent Office included in a general bill, also designating the fund from which it was to be paid, all objection, it is believed, might be obviated.

During the past year a part of the building erected for the Patent Office has, with the approbation of the Secretary of State, been appropriated to the use of the National Institute, an association which has in charge the personal effects of the late Mr. Smithson, collections made by the exploring expedition, together with many valuable donations from societies and individuals. While it affords pleasure to promote the welfare of that institution by furnishing room for the protection and exhibition of the articles it has in charge, I feel compelled to say that the accommodation now enjoyed can be only temporary. The large hall appropriated by law for special purposes will soon be needed for the models of patented articles, which are fast increasing in number by restoration and new applications, and also for specimens of manufacture and unpatented models. An inspection of the rooms occupied by the present arrangement will show the necessity of some further provision for the National Institute.

The Patent Office building is sufficient for the wants of the Patent Office for many years, but will not allow accommodation for other objects than those contemplated in its erection. The design of the present edifice, however, admits of such an enlargement as may contribute to its ornament, and furnish all necessary accommodation for the National Institute; and also convenient halls for lectures, should they be needed in the future disposition of the Smithsonian legacy. Whatever may be done as regards the extension of the present edifice, it is important to erect suitable outbuildings, and to enclose the public square on which the Patent Office is located.

Some appropriation, too, will be needed for a watch. So great is the value of the property within the building, that a night and day watch is indispensable. The costly articles formerly kept in the State Department for exhibition are now transferred to the National Gallery, where their protection will be less expensive than it was at the State Department, since these articles are guarded in common with others. The late robbery of the jewels, so termed, shows the impropriety of depending on bolts and bars, as ingenuity and depravity seem to defy the strength of metals. A careful supervision at all times, added to the other safeguards, is imperiously demanded. I am happy to say that no injury or loss will be sustained from the robbery just alluded to, with the exception of the reward so successfully offered for the recovery of the articles.

By law, the Commissioner is also bound to report such agricultural statistics as he may collect. A statement annexed (marked G) will show the amount of wheat, barley, oats, rye, buckwheat, Indian corn, potatoes, cotton, tobacco, sugar, rice, &c., raised in the United States

in the year 1841. The amount is given for each state, together with the aggregate. In some states the crop has been large, in others there has been a partial failure. Upon the whole, the year has been favorable, affording abundance for home supply, with a surplus for foreign markets, should inducements justify exportation.

These annual statistics will, it is hoped, guard against monopoly or an exorbitant price. Facilities of transportation are multiplying daily; and the fertility and diversity of the soil ensure abundance, extraordinaries excepted. Improvements of only ten per cent. on the seeds planted will add annually from fifteen to twenty millions of dollars in value. The plan of making a complete collection of agricultural implements used, both in this and foreign countries, and the introduction of foreign seeds, are steadily pursued.

It will also be the object of the Commissioner to collect, as opportunity offers, the minerals of this country which are applied to the manufactures and arts. Many of the best materials of this description now imported have been discovered in this country; and their use is only neglected from ignorance of their existence among us. The development of mind and matter only leads to true independence. By knowing our resources, we shall learn to trust them.

The value of the agricultural products almost exceeds belief. If the application of the sciences be yet further made to husbandry, what vast improvements may be anticipated! To allude to but a single branch of this subject. Agricultural chemistry is at length a popular and useful study. Instead of groping along with experiments, to prove what crops lands will bear to best advantage, an immediate and direct analysis of the soil shows at once its adaptation for a particular manure or crop. Some late attempts to improve soils have entirely failed, because the very article, transported at considerable expense to enrich them, was already there in too great abundance. By the aid of chemistry, the west will soon find one of their greatest articles of export to be oil, both for burning and for the manufactures. So successful have been late experiments, that pork (if the lean part is excepted) is converted into stearine for candles, a substitute for spermaceti, as well as into the oil before mentioned. The process is simple and cheap, and the oil is equal to any in use.

Late improvements, also, have enabled experimenters to obtain sufficient oil from corn meal to make this profitable, especially when the residuum is distilled, or, what is far more desirable, fed out to stock. The mode is by fermentation, and the oil which rises to the top is skimmed off, and ready for burning without further process of manufacture. The quantity obtained is ten gallons in 100 bushels of meal. Corn may be estimated as worth fifteen cents per bushel for the oil alone, where oil is worth $1.50 per gallon. The extent of the present manufacture of this corn oil may be conjectured from the desire of a single company to obtain the privilege of supplying the light-houses on the upper lakes with this article. If from meal and pork the country can thus be supplied with oil for burning and for machinery and manufactures, chemistry is indeed already applied most beneficially to aid husbandry.

A new mode of raising corn trebles the saccharine quality of the stalk, and, with attention, it is confidently expected that 1,000 pounds of sugar per acre may be obtained. Complete success has attended the experiments on this subject in Delaware, and leave no room to doubt the fact that, if the stalk is permitted to mature, without suffering the ear to form, the saccharine matter (three times as great as in beets, and equal to cane) will amply repay the cost of manufacture into sugar. This plan has heretofore been suggested by German chemists, but the process had not been successfully introduced into the United States, until Mr. Webb's experiments at Wilmington, the last season. With him the whole was doubtless original, and certainly highly meritorious; and, though he may not be able to obtain a patent, as the first original inventor, it is hoped his services may be secured to perfect his discoveries. It may be foreign to descend to further particulars in an annual report. A minute account of these experiments can be furnished, if desired. Specimens of the oil, candles, and sugar, are deposited in the National Gallery.

May I be permitted to remark that the formation of a National Agricultural Society has enkindled bright anticipations of improvement. The propitious time seems to have come for agriculture, that long neglected branch of industry, to present her claims. A munificent bequest is placed at the disposal of Congress, and a share of this, with private patronage, would enable this association to undertake, and, it is confidently believed, accomplish much good.

A recurrence to past events will show the great importance of having annually published the amount of agricultural products, and the places where either a surplus or a deficiency exists. While Indian corn, for instance, can be purchased on the western waters for one dollar (now much less) per barrel of 196 pounds, and the transportation, via New Orleans, to New York, does not exceed $1.50 more, the price of meal need never exceed from eighty cents to one dollar per bushel in the Atlantic cities. The aid of the National Agricultural Society, in obtaining and diffusing such information, will very essentially increase the utility of the plan before referred to, of acquiring the agricultural statistics of the country, as well as other subsidiary means for the improvement of national industry.

I will only add that, if the statistics now given are deemed important, as they doubtless may prove, to aid the Government in making their contracts for supplies, in estimating the state of the domestic exchanges, which depend so essentially on local crops, and in guarding the public generally against the grasping power of speculation and monopoly, a single clerk, whose services might be remunerated from the patent fund, to which it will be recollected more than $8,000 has been added by the receipts of the past year, would accomplish this desirable object. The census of population and statistics, now taken once in ten years, might, in the interval, thus be annually obtained sufficiently accurate for practical purposes.

All which is respectfully submitted.

HENRY L. ELLSWORTH.

Hon. JOHN WHITE, *Speaker of the House of Representatives.*

List of American Patents that expired in the year 1841.

Alarm for coaches, W. Hunt, N. Y., July 30.
Andirons, constructing feet of brass, J. Griffiths, N. Y., March 15.
Andirons, pedestal, Edmd. Smylie, N. Y., Feb. 1.
Andirons, repairing and finishing, Edmd. Smylie, N. Y., Feb. 22.
Apple mill, H. E. Paine and S. H. Russell, Le Roy, Ohio, March 5.
Apples, machine for grinding, Const. Weeks, Paris, N. Y., April 9.
Aqueduct, J. M. Benham, Bridgewater, N. Y., Aug. 29.
Auger, screw, Judson Smith, Derby, Conn., July 13.
Axletrees and boxes, Cyrus Beach, Newark, N. J., June 26.
Bark mill, cast iron, Wm. Torrey, Westbrook, Me., Sept. 13.
Bed-sacking, mode of tightening, J. R. Simpson, Boston, Mass., July 10.
Bedsteads, sacking bottoms, &c., Dan. Powles, Baltimore, Md., Jan. 26.
Beehive, Cuthbert Wiggins, Fayette, Pa., Feb. 27.
Bellows, Jesse Dixon, Pittsborough, N. C. June 11.
Bellows, J. S. Wilberts, Chili, N. Y., June 12.
Beer, brewing spruce, Wm. Dezeau, Philadelphia, Pa., May 31.
Blower for coal grates, R. Fuller and T. Thomas, N. Y., May 22.
Blowing and striking for blacksmiths, L. Hoyt and E. Pierce, Poultney, N. Y. March 3.
Boat, passing canal locks, R. Graves, Brooklyn, N. Y., July 26.
Boats, for transporting on canals, &c., R. P. Bell, N. Y., July 13.
Bobbin, tube for spinning cotton, B. Hutchison, Philadelphia, Pa., Oct. 18.
Bogging machine, Squire Collins, Hillsdale, N. Y., Feb. 22.
Boilers for anthracite, J. Barker, Baltimore, Md., Feb. 7.
Boilers, supplying steam uniformly, I. Doolittle, Bennington, Vt., June 1.
Boilers, constructing steam, Eb. A. Lester, Boston, Mass., May 14.
Boilers for steam engines, J. Pool, Sheffield, England, May 14.
Boot, constructing, T. Thorp, Richmond co., N. C., Aug. 31.
Boot crimper, Saml. Moorehouse, Eastport, Me., June 19.
Boots or shoes, mode of holding, Saml. Nourse, Danvers, Mass., Dec. 8.
Boring earth, J. R. Failing, Canajoharie, N. Y., June 13.
Boring and tenoning machine, D. Sperry, Colchester, Conn., Feb. 18.
Boxes, self-fastening, T. Mussey, New London, Conn., June 11.
Brick frames, for raising portable, E. Mann and G. Hill, Rochester, N. Y., July 21.
Brick press, A. B. Crossman, Huntington, N. Y., Feb. 9.
Brick press, John Howe, Alna, Me., May 18.
Brick press and moulding, J. McDonald, N. Y., April 24.
Brick machine, D. Rising, Alchester. Vt., March 21.
Brick and tile machine, E. Fisk and B. Hinkley, Fayette, Me., Sept. 8.
Bricks, machine for mixing earth for, D. K. Hill, Richmond co., Geo., Feb. 17.
Bridges, Wm. Woodmansee, Kingston, N. Y., March 6.
Bridges, T. P. Bakewell, Pittsburg, Pa., May 15.
Bridges with draws, G. Wilkinson, White Creek, N. Y., May 5.

Bugle, Kent, R. Willis, West Point, N. Y., Nov. 10.
Building vessels, &c., T. W. Bakewell, Cincinnati, Ohio, Feb. 21.
Buildings, removing, Sim. Brown, N. Y., July 31.
Burning lime and bricks and boiling kettles, Sol. Hill, New Milford, Ct., Feb. 12.
Bush for millstones, Nat. Taylor, Urbana, N. Y., July 23.
Calicoes, etching steel mills for, D. H. Mason, Philada., Pa., Oct. 30.
Cane juice, clarifying, Wm. J. McIntoch, Georgia, March 7.
Card teeth, cutting, J. Lamb, Leicester, Mass., August 1.
Carding machine, Jno. Tilton, Newton, Conn., Sept. 8.
Carpeting, Jer. Bailey, Philadelphia, Pa., April 7.
Carriages, Theo. Brooks and D. W. Eames, Rutland, N. Y., Dec. 26.
Carriages, W. & J. Jessup, Guilford co., N. C., June 1.
Carts for removing earth, Jer. Price, Lockport, N. Y., May 18.
Cement, hydraulic, Ez. Guilford, Washington, D. C., Jan. 16.
Cement, imitation of marble, Ben. Trembly, N. Y., Nov. 13.
Cement, for roofs of houses, &c., Chs. Clinton, N. Y., July 13.
Chair, Edmund Daley, Baltimore, Md., Feb. 9.
Chair, repairing and finishing, Jacob Daley, Baltimore, Md., Feb. 22.
Cheese nets, L. M. Norton, Litchfield, Conn., June 4.
Chimneys, crank and wheel dampers for, J. Reilly and J. Flanagan, Waynesboro', Pa., March 10.
Chisel, bearded mortising machine, S. Metcalf, Wilmington, Vt., Jan. 17.
Churn, S. L. Bagley, Hillsdale, N. Y., March 24.
Churn, Levi Rosencrans, Urbana, N. Y., May 19.
Churn, E. Spain, Mount Holly, N. J., April 23.
Churn, D. Sheldon, Poultney, Vt., Sept. 13.
Churn, N. Whitney, Augusta, Me., May 7.
Churn, rocking, J. G. Phillip, Kinderhook, N. Y., Feb. 15.
Clock, wood wheel, 30 hours, H. G. Dyar, N. Y., Nov. 6.
Cloth sheering, J. Collins, Anson, Me., March 6.
Cloths, washing and scouring, J. Goulding, Dedham, Mass., July 12.
Cock for hydrants, valve, B. Stancliff, Philadelphia, Pa., May 15.
Combs, ornamenting, U. Bailey, West Newbury, Me., Nov. 15.
Combs, &c., rolling the backs of, N. Bishop, Danbury, Conn., Nov. 17.
Composition, marble, granite, &c., L. Mathey, Brooklyn, N. Y., Mch. 7.
Cooking apparatus, D. Westerfield, N. Y. March 24.
Copperas, making, I. Tyson, Baltimore, Md., Feb. 15.
Cordage, by machinery, R. Graves, Brooklyn, N. Y., July 25.
Cork cutter, Luther Hills, Boston, Mass., June 18.
Cork cutting machine, Geo. Rawlings, Philadelphia, Pa., Oct. 30.
Corn crusher, S. H. Gannett, Greenville, Tenn., May 25.
Corn sheller, Thomas Newman, Guilford co., N. C., Feb. 7.
Corn sheller, longitudinal, G. E. Waring, Poundbridge, N. Y., Mch. 16.
Cotton bagging, spinning, J. C. Dewees, Mason co., Ky., Dec. 28.
Cotton, cleaning Sea Island, Jesse Reed, Marshfield, Mass., Aug. 10.
Cotton, packing, Wm. Thomas, Richmond co., N. C., Feb. 15.
Cotton and hay press, T. D. Wilson, Corydon, Ind., June 6.
Cotton press, R. Jernigan, Waynesburg, N. C., May 15.

Cotton press, P. White, Chatham co., N. C., Feb. 19.
Cotton roving, Gilbert Brewster, Poughkeepsie, N. Y., March 28.
Cotton spindle, B. Brundred, Oldham, N. Y., July 14.
Culinary fixtures for anthracite, J. F. Walters, Philada., Pa., June 8.
Cutter, cant twist blade for, C. C. K. Beach, Portland, Me., Nov. 10.
Cutting machine for metals, J. H. Hall, Harper's Ferry, March 7.
Dearborns, balance on, S. Blaisdell, Lancaster, Ohio, Oct. 10.
Distilling, J. M. Aiken, Philadelphia, Pa., August 30.
Distilling, Wm. Coke, Cabinpoint, Va., Oct. 30.
Distilling, J. Lusk, Butler co., Ohio, Dec. 22.
Distilling by escape steam, D. Embree, N. Richmond, Ohio, Dec. 3.
Distilling spirits, fermenting and, I. Belknap, Millersburg, Pa., July 20.
Dividing engine for scales, S. Hedge, Windsor, Vt., June 20.
Dyeing and polishing leather, S. Couillard, Boston, Mass., June 27.
Earth from canals, hauling, O. Phelps, Lansing, N. Y., July 16.
Engines, constructing, E. A. Lester, Boston, Mass., May 14.
Fanning mill, Enoch Walker, Springfield, Pa., Sep. 20.
Flax dressing, H. Schoonhoven, Poultney, N. Y., Dec. 11.
Flax thrashing and breaking, P. Barker, Worthington, Ohio, Aug. 20.
Frame chain, David Lesley, N. Y., Nov. 19.
Fur cutting machine, M. Petre, Womelsdoff, N. Y., Dec. 20.
Fur, separating hair from, John McDonald, N. Y., Sept. 11.
Gas and heated air in aid of the power, M. Ward, Baltimore, Md., May 15.
Gas light from cotton seed, D. Olmsted, New Haven, Conn., July 21.
Gases procured in charring wood, S. J. Jones, Philada., Pa., Jan. 17.
Gate for canals, safety, Van Dorn and J. Glenn, N. Y., May 14.
Glass, combination of moulds in forming, G. and P. C. Dummer and J. Maxwell, Jersey City, N. J., Oct. 16.
Glass, moulds for preparing, P. C. Dummer, Jersey City, N. J., Oct. 16.
Glass knobs dressed at one operation, J. Robinson, Pittsburg, Pa. Oct. 6.
Grain, cleaning, J. Tyler, Claremont, N. H., May 11.
Grist mill, W. Adams, Guilford, N. C., July 18.
Grist mill, A. Bencine, Caswell, N. C., Jan. 16.
Grist mill, Wm. Benbow, Guilford co., N. C., Jan. 19.
Grist mill, A. and J. Coe, Guilford co., N. C., July 21.
Grist mill, A. Delap and A. Eve, Guilford co., N. C., May 31.
Grist mill, Wm. W. Forward, Hartford, Conn., June 18.
Grist mill, T. Newman, Guilford co., N. C., Feb. 6.
Grist mill, B. Overman, Greenbury, N. C., Sept. 28.
Grist mill, J. Robinson, Buckskin Township, Ohio, Dec. 14.
Grist mill, R. S. Thomas, Rockingham, N. C., June 4.
Grist mill, Wm. A. Turner, Plymouth, N. C., June 27.
Grist mill, crusher and sheller, J. G. Morse, Randolph co., N. C., March 20.
Grist mill, improvement on Mendenhall's, S. Lawing and J. Monteith, Statesville, N. C., June 11.
Grist mill, sugarloaf and, S. and P. Moore, Mt. Tirzah, N. C., June 15.
Gun lock, S. Cromwell, Edgecomb, Me., Feb. 3.
Gun lock, percussion, M. Davis, Mayville, N. Y., July 10.

Gun lock, percussion, Wm. A. Hart, Fredonia, N. Y., Feb. 20.
Hammer, foot trip, E. Pierce and J. Hathaway, Poultney, Vt., Oct. 19.
Harrow teeth, Wm. McConaughey, New Garden, Pa., Feb. 16.
Hat bodies, setting up, J. Grant, Providence, R. I., April, 10.
Hats, gearing of cones for bowing, T. F. Mayhew, Boston, Mass., Aug. 22.
Hats, stiffening of waterproof, S. Hemstead, Jr., St. Charles co., Mo., May 26 and Oct. 26.
Hatters' cards, or jacks, making, J. C. Seely, Dutchess co., N. Y., March 15.
Heat, evolution and management of, E. Nott, Schenectady, N. Y., May 30.
Heaving down vessels, J. Crowninshield, Salem, Mass., Oct. 19.
Hides, protecting from moths, Saml. Storm, N. Y., Feb. 17.
Hoes by rolling cast steel, } Chy. Bulkley, Colchester, Conn., Jan. 10.
Hoes, of cast iron, }
Hoes, harrows and ploughs, J. Cheatham, Providence Inn, Va., July 31.
Hoes, pronged, Jos. Wilson, Marlborough, N. H., Sept. 20.
Hoes, &c., ploughing and weeding, Wm. Carmichael, Sand Lake, N. Y., July 28.
Hollow ware, wooden, E. Briggs, Perry, N. Y., July 30.
Homony mill, Robt. Campbell, Martinsburg, Va., April 9.
Hoop and sheet iron manufactory, J. H. Pierson, Ramapo Works, N. Y., Dec. 24.
Horse yoke, Ad. Allen, Troy, N. Y., June 29.
Horse and hay rake, Jer. Bailey, Philadelphia, Pa., Mch. 30.
Hubs, cast iron, Benj. Lyman, Manchester, Ct., Nov. 6.
Hydraulic elevator, D. Corey, N. Y., Aug. 31.
Hydraulic machine, Jac. Roup, Kenhawa, Va., Oct. 6.
Inlaying gold in tortoise shell, U. Bailey, West Newbury, Me., Feb. 23.
Iron, rolling, Ab. S. Valentine, Bellefonte, Pa., June 3.
Jointing boards, El. H. Clarke, Damascas, Pa., Jan. 31.
Lamp for boiling water, T. G. Fessenden, Boston, Mass., Jan. 31.
Lathe for turning, Wm. Patrick, Leverett, Mass., April 24.
Leather, making water-proof, D. Kiser, N. Y., Nov. 19.
Lever gained power, E. G. Fitch, Blakely, Ala., Oct. 5.
Lime kiln, Abel Jeanes, Mill Creek Hundred, Del., Feb. 15.
Liquors, testing strength of, Wm. Cornell, Brooklyn, N. Y., Aug. 20.
Locks, J. Brown and G. W. Robinson, Providence, R. I., Feb. 20.
Locks, percussion, M. Davis, Mayville, N. Y., July 10.
Locks, percussion, Wm. A. Hart, Fredonia, N. Y., Feb. 20.
Locks, percussion, Jos. Shattuck, Jefferson co., Ohio, Nov. 10.
Locks, percussion lever, J. Ambler, Jr., S. New Berlin, N. Y., Oct. 16.
Locks, percussion magazine, J. B. Lowry, Mayville, N. Y., Sept. 11.
Loom for figured goods, H. Baker, North Salem, Aug. 31.
Loom, power, Wm. B. Leonard, Fishkill, N. Y., May 23.
Marine railway, Jos. Webb, N. Y., May 14.
Marine railway, J. Wood and P. A. Sabalan, N. Y., Oct. 6.
Mill, horizontal, Jon. Reynold, Amenia, N. Y., March 15.
Moccasins, water-proof, John Syms, N. Y., Nov. 14.

Mortar machine and grinding apples, J. H. Sheeler and J. S. Wilbert, Chili, N. Y., June 12.
Mortising machine, A. Greenleaf and H. Amidon, Mexico, N. Y. Dec. 28.
Mortising machine, Simon Le Roy, Mexico, N. Y., July 10.
Mortising and tenoning timber, J. McClintic, Chambersburg, Pa., March 31.
Navigation, improvement in, John J. Giraud, Baltimore, Md., Jan. 31.
Oil from flaxseed, D. Dodge, Hamilton, Mass., May 14.
Ovens, heating rooms, &c., Mich. Porteaux, Richmond, Va., Jan. 17.
Paddles, folding boat, E. Jenks, Colebrook, Conn., June 13.
Paddles, water, John J. Giraud, Baltimore, Md., Sept. 18.
Paint mill, Allen Holcomb, Butternuts, N. Y., May 14.
Paint mill, horizontal cast iron, O. Packard, Wilmington, Vt., Feb. 12.
Paper finishing, Ira White, Newburg, Vt., Feb. 28.
Paper machine trimming, J. McClintic, Chambersburg, Pa., Mch. 31.
Pianos, horizontal, T. Loud, Jr., Philadelphia, Pa., May 15.
Pipes, tubes, &c., Jos. Putnam, Salem, Mass., Jan. 17.
Piston, rotative, J. M. Cooper, Guildhall, Vt., July 16.
Plane or jointer irons, Chas. E. West, Colchester, Conn., Jan. 10.
Plane stocks of cast iron, H. Knowles, Colchester, Conn., August 24.
Plane, turner, sliding, Jon. Sparrow, Portland, Me., Dec. 26.
Planing machine, Jos. Rechm, Savage Factory, Md., Nov. 1.
Plough, Wm. Beach, Philadelphia, Pa., June 27.
Plough, R. Rhodes, Charlottesville, Va., Feb. 20.
Plough, angular, John Lupton, Va., July 31.
Plough, bar share, Eli Pugh, Chathan co., Conn., Dec. 24.
Plough, cast iron, R. Sweenney, Warren co., Ohio, May 18.
Plough, for planting corn, B. Murphy, Union District, S. C., Dec. 31.
Plough, for planting corn, H. Russell, Litchfield, Me., Jan. 16.
Plough, right and left, Geo. Dolfer, Frederick Town, Md., Aug. 20.
Plough, twin, N. G. Cryer, Wentworth, N. C., March 24.
Polishing hard and soft substances, B. Green, Hartford, Vt. Mch. 27.
Power by certain fluids, M. J. Brunel, London, England, Mch. 30.
Preserving butter, eggs, &c., H. Edmonston, Pike Creek, Md., Apr. 26.
Printing press, S. J. Couillard, Boston, Mass., July 14.
Propelling boats, Elisha Fuller, Providence, R. I., March 2.
Propelling boats, &c., Elijah Bryan, N. Y., Dec. 22.
Propelling machinery by weights, C. Broyles, Tellico, Tenn., Oct. 19.
Propelling machinery of all kinds, Wm. Stanton, Centre Township, Pa., April 23.
Pump, for steam boilers, A. Judson, Sweden, N. Y., Feb. 24.
Pumping vessels by wind power, T. Brownell, N. Y., March 23.
Railway carriage, R. P. Morgan, Stockbridge, Mass., July 27.
Rake, hand hay, A. Foster, Auburn, N. Y., Dec. 9.
Rake, hay and grain, M. and S. Pennock, East Marlboro', Pa., Feb. 17.
Rake and hoe handles, turning, { W. Shepperdson, Hamilton, N. Y., / J. C. Sperry, Camden, N. Y., Dec. 3.
Rake and hoe handles, turning, A. Sperry, Rotterdam, N. Y., Dec. 26.

Rake teeth, turning tenons for, J. W. Sweet and W. Stedman, Berkshire, Mass., March 5.
Rice cleaning and hulling, J. Campbell, Winsborough, S. C., May 3.
Rice and coffee cleaning, E. Welder, Jersey City, N. J., Nov. 6.
Rooms, warming, A. S. McAllister and J. Iggett, Salem, N. Y., Dec. 15.
Rope layer, *(jack and breast work,)* D. Myerle, Philada., Pa., Mch. 3.
Sack shoulderer, L. Rice, Clarksborough, N. J., August 3.
Safety valve, chimney smoke, &c., J. H. Schreiner, Philadelphia, Pa., July 31.
Salt manufacture, B. Byington, Salina, N. Y., Feb. 21.
Saw mill, A. Bencine, Milton, N. C., June 4.
Saw mill, B. Overman, Greensbury, N. C., Dec. 11.
Saw mill, J. Spafford, Ipswich, Mass., June 23.
Saw mill, of Johnson's, A. B. Graham, Lee, Mass., Sept. 28.
Saw mill, reciprocating, Wm. Kendall, Waterville, Me., Dec. 31.
Saw mill, reciprocating, Wm. Kendall, Jr., Waterville, Me. Nov. 23.
Saw sett, spring, J. Baggs, Philadelphia, Pa., Oct. 4.
Saw, two edged, M. Cass and A. Bull, Caroline, N. Y., August 31.
Scagliola, shining, S. Pinistre, N. Y., June 18.
Scurvy, preventive from, J. M. Armour, Frederick Town, Md., Sept. 28.
Sheaves for shipping, cast iron, F. Seymour, Plymouth, Mass., Dec. 29.
Shingle machine, J. Daley, Baltimore, Md., Sept. 27.
Shingle machine, G. W. Dana, Rutland, Vt., Sept. 20.
Shingle machine, improvement on Hawes', G. A. Hoard, Antwerp, N. Y., Sept. 30.
Shingle, manufacturing, P. Hawes, Lockport, N. Y., March 30.
Shingle, manufacturing, O. Wheeler, Rochester, N. Y., Nov. 10.
Shingle, sawing machine, N. Swift, Lebanon, Conn., April 27.
Shovels, making, O. Ames, Easton, Mass., March 5.
Shuttle, mode of throwing, J. Goulding, Dedham, Mass., August 24.
Sleigh shoes, cast iron, E. Trask, Saugerties, N. Y., Oct. 6.
Sofa bedstead, J. R. Penniman, Boston, Mass., August 22.
Spectacles and single eye glasses, S. Newton, Washington, D.C., Dec. 22.
Spindles, preventing friction on, J. G. Sholtz, Rockaway Township, Ohio, July 6.
Spinner, Brown's vertical, H. Wilson, Pomfield, N. Y., July 13.
Spinner, family, Wm. Jones, Thornville, Ohio, July 27.
Spinner, for wool, B. Lapham, Queensbury, N. Y., June 29.
Spinning machine, N. Remington, Geneva, N. Y., April 21.
Spinning wool and cotton, W. Church, Birmingham, Eng., July 11.
Spur for bevel gearing, C. Neer, Waterford, N. Y., March 9.
Staves, preparing for truss hoop, A. Amsden, Bloomfield, N. Y., July 27.
Steam and rotary wheel, F. Harris, Albany, N. Y., July 10.
Steam engine, J. Maynard, Ovid, N. Y., June 15.
Steam engine, W. P. Wing, Newburg, Vt., August 17.
Steam, generating, L. Silliman, Albany, N. Y., Jan. 19.
Steam, heating by escape, A. Brown, N. Y., Oct. 30.
Steelyards, lever power, S. Andrews, Bridgetown, Me., March 24.

Still, M. McGregor, N. Y., June 15.
Stone, dressing, drilling and cutting, H. Bourne, Salem, Mass., Aug. 3.
Stone, hewing and hammering, C. B. Reed, West Bridgewater, Mass., June 27.
Stove, air funnel, H. Wales, Randolph, Mass., May 18.
Stove, cast iron foot, G. W. Robinson, N. Y., June 2.
Straw cutter, T. Benbow, Guilford, N. C., Feb. 16.
Straw cutter, L. Durham and J. H. Pleasants, Halifax co., Va., July 27.
Straw cutter and corn sheller, C. Chamberlain, Amenia, N. Y., Mch. 15.
Stumps, machine for raising, A. Pratt, Jackson, N. Y., August 17.
Suspenders, E. Chesterman, N. Y., June 19.
Suspenders, A. L. Van Horn, Philadelphia, Pa., Feb. 22.
Tailor's square, J. G. Wilson, N. Y., Feb. 28.
Tanning, O. Cogswell, Cincinnati, Ohio, Sept. 18.
Team scraper or shovel, G. Davis and J. Price, Lockport, N. Y., May 12.
Teeth, engrafting, E. A. Bigelow, Brandon, Vt., March 8.
Templets, spring, A. Jenks, and J. Clewell, Holmsburg, Pa., Mch. 19.
Thrashing machine, E. B. Pike, Litchfield, Me., Oct. 5.
Thrashing machine, vibrating, M. Pennock, Kennett's Square, Pa., May 26.
Thrashing, winnowing and flax breaking machine, E. Warren, N. Y., August 11.
Tide mill, R. Spedden, Talbot, Md., August 1.
Tire, bending, W. James, Ashford, Conn., July 14.
Tobacco, manufacturing, J. Ambler, Jr., Richmond, Va., April 3.
Tread wheel, C. Watson, Addison township, Ohio, Dec. 22.
Tubs of clay, machine for making, J. H. Rowen and H. Wise, Fredericktown, Pa., May 10.
Tubs, making wood sides of, J. Bailey, Philadelphia, Pa., April 7.
Type caster, mechanical, J. Sturdevant, and E. Starr, Boston, Mass., Oct. 23.
Vessels, raising by cradle screw, C. Miner, Lynn, Ct., Oct. 12 & Nov. 16.
Vessels, slinging yards of, I. Carver, Jr., Prospect, Me., Dec. 11.
Vests, spring stiffener for, J. D. Shute, Boston, Mass., Dec. 5.
Victualler, B. C. Burdett, N. Y., August 4.
Washing clothes and shelling corn, B. Rice, Denmark, N. Y., Nov. 23.
Washing machine, D. Beard, Buffalo, N. Y., June, 27.
Washing machine, M. Cass, Caroline, N. Y., July 29.
Washing machine, F. Kelsey, Middletown, Conn., Sept. 28.
Washing machine, C. Stone, Middleburg, Conn., Feb. 17,
Watch keys, J. S. Davis, Providence, R. I., April 3.
Watch seals, S. Davis, P. Babbett and H. P. Grunnell, Providence, R. I., March 3.
Water gate for penstocks or flumes, H. Potes, Christianburg, Va., Jan. 9.
Water gate, opening and shutting, O. Packard, Wilmington, Vt., Feb. 12.
Water power, apparatus to wheels, R. and T. McCulloch, Albemarle co., Va., May 26.
Water raised by revolving wheel, H. Miller, Allentown, Pa., July 28.